VARA
CONSULTING

18 December 2024

Mr. Jeff Smith
General Manager
Maitland City Council
PO Box 220
MAITLAND NSW 2320

Att: Mr Adam Kennedy

Dear Adam,

RE: Progression of Planning Proposal - 107 Haussman Drive, Thornton (PP-2023-2323)

I refer to Maitland City Council's letter dated 27 November 2024, and our subsequent meeting on 12 December 2024 regarding the above Planning Proposal. On behalf of the current owner of the site, Tracey Ann McCloy, I am writing to confirm that we wish to continue to progress with the proposal.

Please feel free to contact me if you have any questions.

Regards,

Vara Consulting
Jason McIntosh
Director
0417 689 270

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14 April 2025

Mr. Jeff Smith
General Manager
Maitland City Council
PO Box 220
MAITLAND NSW 2320

Att: Mr Adam Kennedy

Dear Adam,

RE: Progression of Planning Proposal - 107 Haussman Drive, Thornton (PP-2023-2323)

I refer to the letter from NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) dated 29 August 2024, which was also referenced in Maitland City Council's letter dated 27 November 2024.

One of the matters raised for consideration by DCCEEW was document consistency, as follows:

It is unclear if the BDAR, for example Figures 2 and 4 and Table 9, have considered Asset Protection Zone impacts as shown in Figure 1.1 of the Bushfire Threat Assessment.

Recommended action:
Consider improving consistency between documents, to ensure areas of high environmental value are protected and impacts are accurately identified and offset.

Figures 2 and 4 of the BDAR are included under Annexure A of this letter.

Since the change of ownership in the land, we have been unable to properly engage with the original bushfire consultant for the project. We have therefore engaged Bushfire Planning Australia to prepare supplementary information that supports consistency between required APZ's and the BDAR mapping. The required APZ's determined under AS3959-2018 are shown under Annexure B of this letter. It should be noted that the figure under Annexure B demonstrates that APZ's can be achieved within the impacted footprint shown in the BDAR.

Please feel free to contact me if you have any questions.

Regards,

Vara Consulting
Jason McIntosh
Director
0417 689 270

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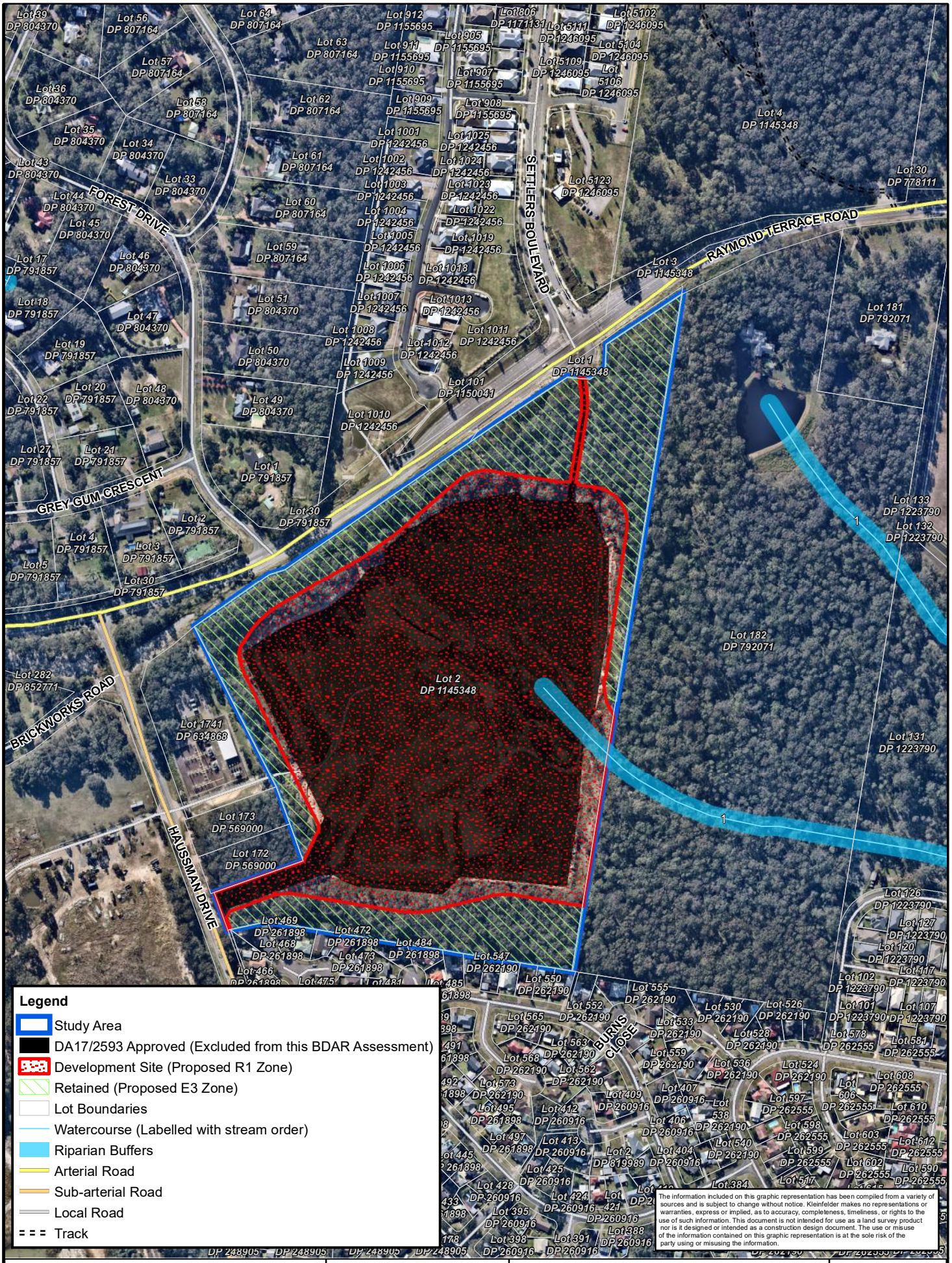
Appendix A – Figures 2 and 4 of the BDAR



Metres
0 25 50 100 150 200 250
N

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PROJECT REFERENCE: 20220611

DATE DRAWN: 8/9/2022 10:17 Version 1

DRAWN BY: AMcDonaugh

DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2021

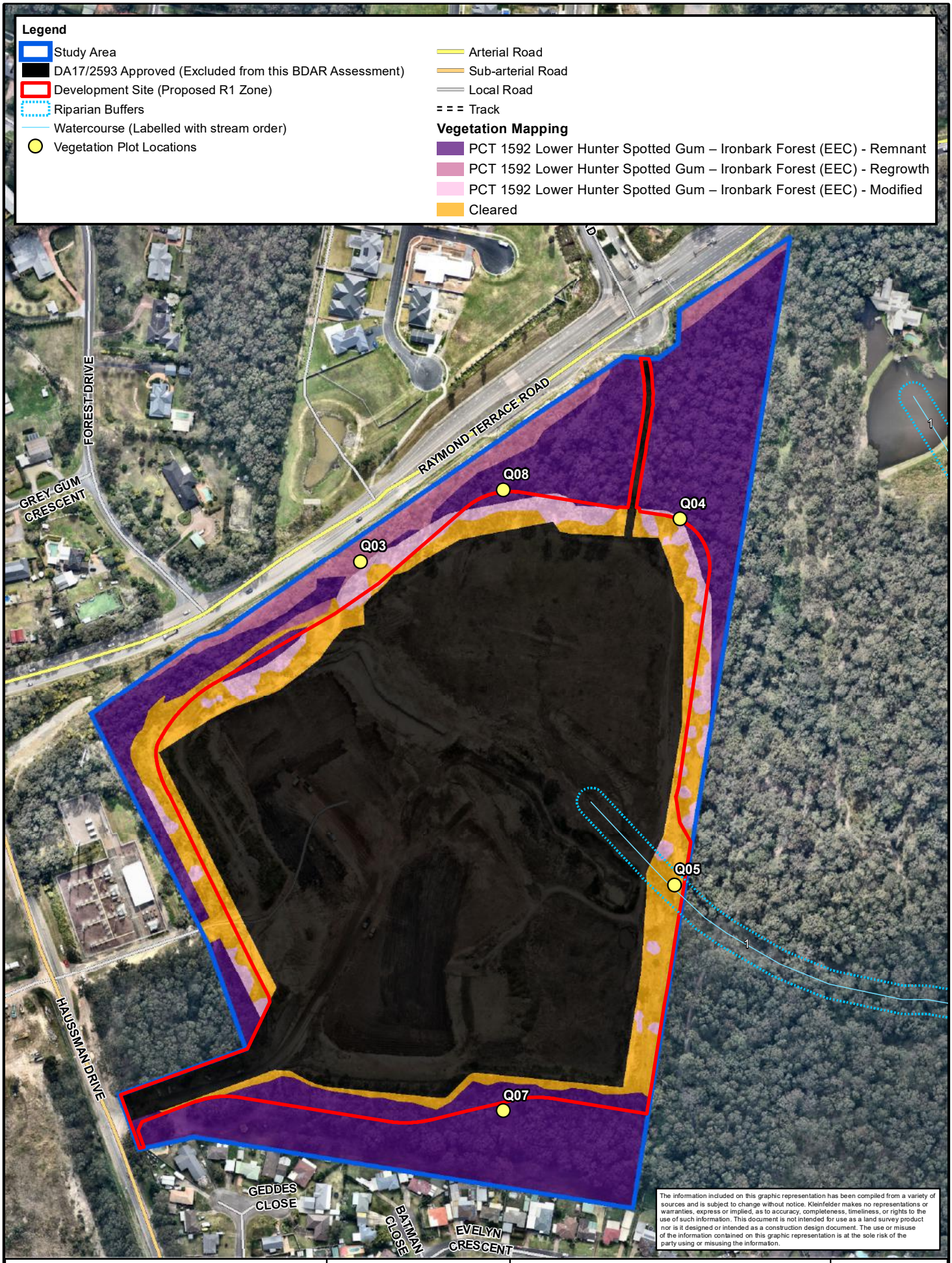
Study Area and Development Site

McCloy Group
Biodiversity Development Assessment Report
Lot 2 DP 1145348
Haussman Drive, Thornton NSW

FIGURE:

2

J:\00 CLIENT FILES\127490_McCloy_Group\20220611_BDAR_HaussmanDrive_May2021\Mapping\20220729_BDAR_Fig02_StudyArea_DevelopmentSite.mxd



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DRAWN BY: AMcDonaugh
DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2021

Vegetation Communities

McCloy Group
Biodiversity Development Assessment Report
Lot 2 DP 1145348
Haussman Drive, Thornton NSW

FIGURE:
4

J:\00 CLIENT FILES\127490_McCloy_Group\20220611_BDAR_HaussmanDrive_May2021\Mapping\20220729_BDAR_Fig04_VegetationCommunities.mxd

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Appendix B – Proposed APZ's under AS3959-2018

Subject site

100m buffer

140m buffer

Asset Protection Zone

Vegetation Class

Hunter-Macleay Dry Sclerophyll Forests

Basin

Forest Drive

Raymond Terrace Road

ROAD 1 17 WIDE

ROAD 2 17 WIDE

ROAD 3 17 WIDE

ROAD 4 17 WIDE

ROAD 5 17 WIDE

ROAD 6 17 WIDE

ROAD 7 17 WIDE

ROAD 8 17 WIDE

PARK

BASIN

Haussman Drive

Geddes Close

Geddes Close

Evelyn Crescent

BUSHFIRE PLANNING AUSTRALIA	Source:	Cadastral Boundary: NSW Department of Finance, Services and Innovation 2025 Aerial photo: Nearmap 26/01/2025 Vegetation: Bushfire Planning Australia 2025, based on NSW SVTM © State Government of NSW and Department of Planning and Environment 2024	Project: Thornton Strategic Bushfire Study Job No: 2535
	Disclaimer:	No warranty is given in relation to the data (including accuracy, reliability, completeness, currency or suitability) and no liability is accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.	
	File:	File: 2535-Thornton-FigZ-AssetProtectionZone-Method2-250411 Date: 11/04/2025	

N

0 25 50 75

Meters

A3 Scale: 1:2,000

Coordinate System: GDA 1994 MGA Zone 56

Figure:

Asset Protection Zone - Performance Solution (Method 2 - AS3959-2018)

M^CLAREN TRAFFIC ENGINEERING

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Postal: P.O Box 66 Sutherland NSW 1499

Telephone: +61 2 8355 2440
Fax: +61 2 9521 7199
Web: www.mclarentraffic.com.au
Email: admin@mclarentraffic.com.au

Division of RAMTRANS Australia ABN: 45067491678 RPEQ: 19457

Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

11 February 2025 Reference: 241074.01DB

Vara Consulting
Suite 9A,
172 - 178 Pacific Highway,
Swansea NSW 2281
Attention: Jason McIntosh

SUPPLEMENTARY TRAFFIC IMPACT ASSESSMENT FOR RESIDENTIAL SUBDIVISION AT 107 HAUSSMAN DRIVE, THORNTON

Dear Jason,

Reference is made to your request to provide a supplementary traffic impact assessment of the proposed residential subdivision at 107 Haussman Drive, Thornton. This report should be read as a supplement to the traffic and parking impact assessment report by M^CLaren Traffic Engineering dated 8 October 2020 (MTE Report) (reference 200695.01FA) and the Supplementary Traffic Assessment dated 24 November 2022 (reference 220798.01FA).

Comments have been provided by TfNSW regarding the traffic and transport impacts of the proposal as follows:

> *"Further information to support the Planning Proposal is required to identify how the traffic and transport impacts of the proposal can be appropriately mitigated in the absence of any funded project (projects listed in dot points below). The modelling and subsequent recommendations from the TPIA and TIA are contingent upon the following transport infrastructure improvements, which are not funded for delivery:*
>
> *Duplication of Haussman Drive between Taylor Avenue and Raymond Terrace Road;*
>
> *Upgrade of Taylor Avenue / Haussman Drive intersection to a dual-lane roundabout;*
>
> *Upgrade of Raymond Terrace / Haussman Drive intersection to signal control, including extra lanes; and*
>
> *Duplication of Raymond Terrace Road between Haussman Drive and Harvest Boulevarde.*

At this time, TfNSW is unable to provide a final response to the agency consultation due to the uncertainty regarding the timeline for delivering these necessary transport infrastructure improvements, which are being relied on to mitigate the impacts of the proposal and facilitate the subsequent release of land."

To address the matters raised, the Aimsun model has been re-run using base and development traffic volumes to examine the performance of the traffic network without the planned upgrades. The modelling methodology adopted is consistent with that described in the Supplementary Traffic Assessment. Two access scenarios were considered, being:

- All vehicles are required to turn left into and out of the site.
- Right turns are permitted into the site, left turns are permitted into the site and left turns are permitted out of the site.

The results of the assessment are outlined in **Table 1**.

In addition to the modelling of the proposed scale of development under the Planning Proposal, the traffic volumes associated with the approved development (DA17/2593), which included a total of 156 Independent Living Units (ILUs), were modelled. Access to the approved ILU development was restricted to left turns in and left turns out only and was modelled accordingly.

The results of the modelling indicate the following outcomes:

- There is no change in level of service at any of the intersections surrounding the site as a result of the proposed development, regardless of whether right turns into the site are permitted.
- The intersection of the proposed site access driveway and Haussman Drive is expected to perform at a Level of Service of A in both peak hours, regardless of whether right turns into the site are permitted.

Whilst the traffic model provided by TfNSW includes a much larger scope than just these intersections, the impact on any intersections further afield will be less than that at those modelled and there is no need to provide results for other intersections.

Considering the results of the modelling, the same conclusions as the Supplementary Traffic Advice dated 24 November 2022 are maintained, being that:

- The traffic generation associated with a 160-lot residential subdivision will have little to no noticeable effect on the performance of the road network.
- Both access options assessed (left-in / left-out and left-in / right-in / left-out) perform acceptably and there is no clear difference in the performance of the road network based on the options assessment.
- It is likely that a right-turn into the site would provide for a superior level of amenity for residents and, considering that the modelling demonstrates that it will have no adverse impact on the road network, it is the superior option for access to the site.

Please contact the undersigned on 9521 7199 should you require further information or assistance.

Yours faithfully,

McLaren Traffic Engineering

Tom Steal
Associate
BE Civil MIEAust
RMS Accredited Level 3 Road Safety Auditor

TABLE 1: RESULTS OF MODELLING

Intersection	Control	Peak Period	Average Delay (worst)	Level of Service (worst)	Maximum Average Vehicle Queue (Approach)
BASE CASE					
Raymond Terrace Road / Harvest Boulevard	Signals	AM	34.2 (43.5) (North RT)	C (D)	2.5 (North RT)
		PM	33 (40) (East RT)	C (C)	2.7 (West LT)
Haussman Drive / Raymond Terrace Road	Give Way	AM	7.5 (21.7) (South RT)	A (B)	0.4 (South RT)
		PM	8.8 (26) (South RT)	A (B)	0.5 (South RT)
Raymond Terrace Road / Settlers Blvd	Signals	AM	21.5 (50) (West UT)	B (D)	1 (North LT)
		PM	14.7 (42) (West UT)	B (C)	1 (East T)
Site Access	Give Way	AM	3.6 (5.6) (South T)	A (A)	0 (North LT)
		PM	2.7 (4) (South T)	A (A)	0 (North LT)
NO RIGHT TURN IN					
Raymond Terrace Road / Harvest Boulevard	Signals	AM	33.7 (45.9) (North RT)	C (D)	2.6 (North RT)
		PM	34.6 (39) (North RT)	C (C)	3.1 (West LT)
Haussman Drive / Raymond Terrace Road	Give Way	AM	7.6 (22.6) (South RT)	A (B)	0.5 (South RT)
		PM	9.2 (30) (South RT)	A (C)	0.6 (South RT)
Raymond Terrace Road / Settlers Blvd	Signals	AM	21 (34.6) (East RT)	B (C)	0.9 (North LT)
		PM	15.4 (26) (East RT)	B (B)	1.3 (East T)
Site Access	Give Way	AM	3.7 (5.2) (South T)	A (A)	0.1 (East LT)
		PM	2.5 (6) (South RT)	A (A)	0.1 (South RT)
RIGHT TURN IN PERMITTED					
Raymond Terrace Road / Harvest Boulevard	Signals	AM	30 (35.1) (North RT)	C (C)	1.9 (North RT)
		PM	37 (41) (North LT)	C (C)	3 (West LT)
Haussman Drive / Raymond Terrace Road	Give Way	AM	7.6 (23.4) (South RT)	A (B)	0.5 (South RT)
		PM	13 (38) (South RT)	A (C)	1.1 (South RT)
Raymond Terrace Road / Settlers Blvd	Signals	AM	23.2 (38.5) (West UT)	B (C)	1 (North LT)
		PM	17.9 (29) (West UT)	B (C)	1.3 (East T)
Site Access	Give Way	AM	1.9 (7.4) (South RT)	A (A)	0.1 (East LT)
		PM	6 (10) (South T)	A (A)	0.1 (East LT)
APPROVED 156 ILU DEVELOPMENT					
Raymond Terrace Road / Harvest Boulevard	Signals	AM	34.4 (43.4) (North RT)	C (D)	2.5 (North RT)
		PM	34.6 (40) (East RT)	C (C)	2.9 (West LT)
Haussman Drive / Raymond Terrace Road	Give Way	AM	7.6 (22.4) (South RT)	A (B)	0.5 (South RT)
		PM	9.4 (27) (South RT)	A (B)	0.6 (South RT)
Raymond Terrace Road / Settlers Blvd	Signals	AM	21.2 (34.2) (East RT)	B (C)	1.1 (North LT)
		PM	16 (35) (East RT)	B (C)	1.1 (East T)
Site Access	Give Way	AM	3.8 (5.8) (South T)	A (A)	0.1 (East LT)
		PM	3.5 (6) (East LT)	A (A)	0.1 (East LT)

107 Haussman Drive, Thornton
Biodiversity Development Assessment Report

107 Haussman Drive (Lot 2 DP1145348), Thornton NSW 2322 20220611

09 September 2022

KLEINFELDER
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Suite 3, 240-244 Pacific Highway,
Charlestown, NSW 2290

Phone: +61 2 4949 5200

107 Haussman Drive, Thornton
Biodiversity Development Assessment Report

107 Haussman Drive (Lot 2 DP1145348), Thornton NSW 2322

Kleinfelder Project: 20220611

Kleinfelder Document: NCA22R125923

Prepared for: McCloy Group

Sam Rowe
Suite 2, Ground Floor, 317 Hunter St Newcastle NSW 2300
PO Box 2214 Dangar NSW 2309

Prepared by: Ben Stewart

Kleinfelder Australia Pty Ltd

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ABN: 23 146 082 500

Document Control:

Version	Description	Date
1.0	Draft	16 August 2022
2.0	Final	09 September 2022
Prepared	Reviewed	Endorsed
Ben Stewart	Dan O'Brien	Dallas Milburn

TABLE OF CONTENTS

TABLES

FIGURES

PLATES

APPENDICES

1 INTRODUCTION

1.1 SCOPE

Kleinfelder Australia Pty Ltd (Kleinfelder) was engaged by McCloy Group, to prepare a streamline Biodiversity Development Assessment Report (streamline BDAR) to identify constraints associated with the rezoning of Lot 2 DP 1145348 from RU2 – Rural Landscape to R1 General Residential and E2 – Environmental Conservation (Figure 1). The following terms are used throughout this report to describe particular geographical areas:

- Study Area (19 ha) – Lot 2 DP1145348 (107 Haussman Drive, Thornton NSW 2322) (**Figure 2**)
- Development Site – proposed R1 Zone (**Figure 2**)
- Retained – proposed E3 Zone (**Figure 2**)
- Locality – land within a 5 km radius of the Study Area (**Figure 1**).

1.2 LOCAL CONTEXT

The study area is approximately 19 hectares (ha) and is legally defined as Lot 2 DP 1145348. The Study Area is located in the Maitland City Council (MCC) Local Government Area (LGA) and is zoned RU2 – Rural Landscape under the Maitland Local Environmental Plan 2011 (Maitland LEP 2011).

The study area adjoins Rural lands (RU2) to the east and west, General Residential lands (R1) to the north and south, and Large Lot Residential lands (R5) to the north-west. It is located generally on the south-eastern corner where Haussman Drive intersects with Raymond Terrace Road. Lands zoned E3 – Environmental Management are located further to the east, and also further to the south-west on the southern side of the train line. It is understood that a rezoning/subdivision is proposed on the adjacent land to the east (480 Raymond Terrace Road, Lot 182 DP 792071). The site is mapped as Category 1 land in the Maitland Urban Settlement Strategy.

1.3 PROPOSED REZONING

Kleinfelder understands that large part of the site is subject to an approved development (DA17/2593). The extent of the approved development is shown on Figure 2. The approved development also includes an Asset Protection Zone (APZ) which extends beyond the extent of the approved DA boundary as shown on Figure 2. The proposed rezoning of the central portion of the site to R1 – General Residential includes the area of approved development and a narrow band around the extent of the approved DA (mostly cleared). The remaining areas of the site are proposed to be rezoned E3 – Environmental Management.

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PROJECT REFERENCE: 20220611

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DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2021

Locality

McCloy Group
Biodiversity Development Assessment Report
Lot 2 DP 1145348
Haussman Drive, Thornton NSW

FIGURE:

1

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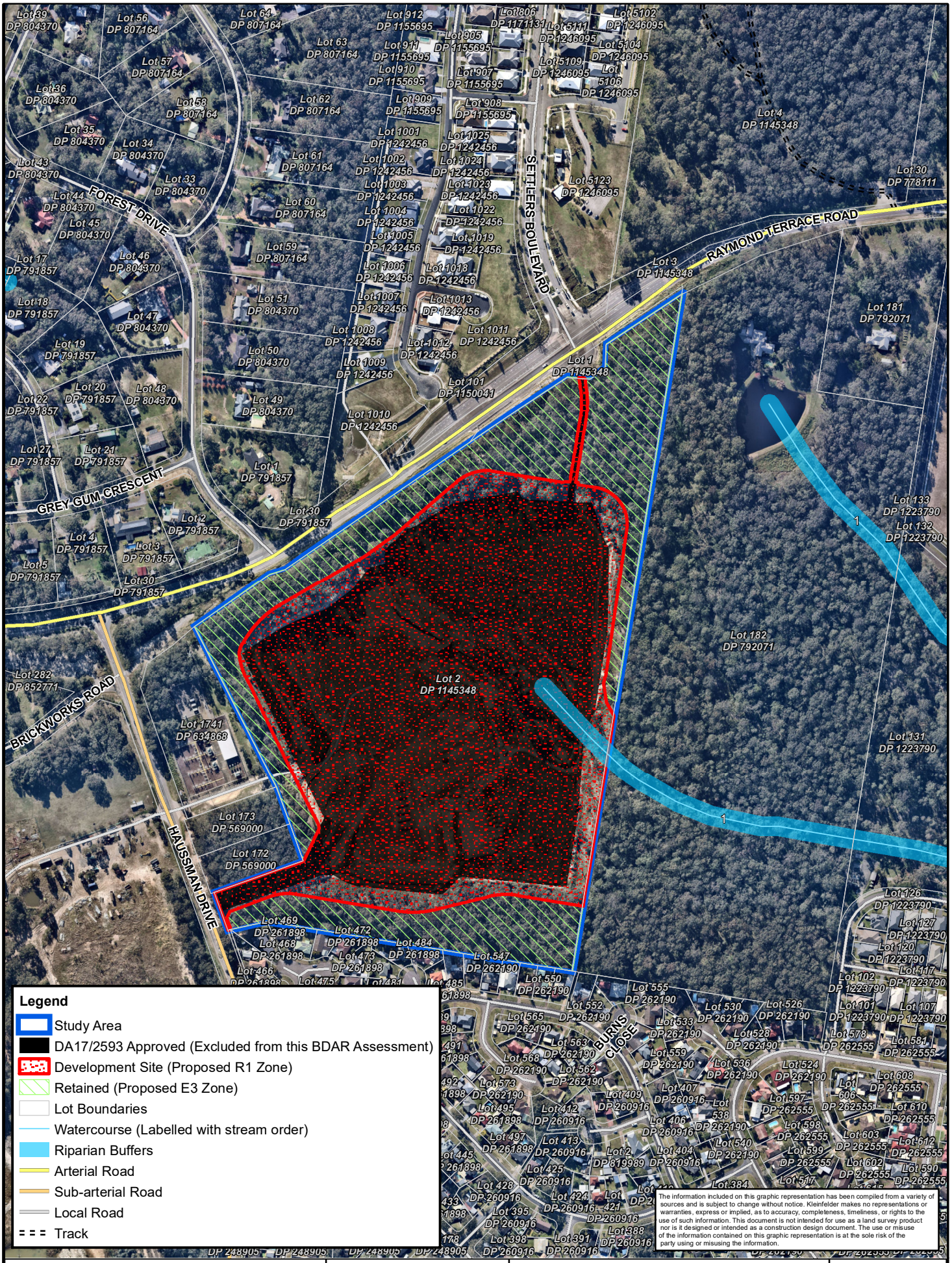

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PROJECT REFERENCE: 20220611

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DRAWN BY: AMcDonaugh

DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2021

Study Area and Development Site

McCloy Group
Biodiversity Development Assessment Report
Lot 2 DP 1145348
Haussman Drive, Thornton NSW

FIGURE:

2

J:\00 CLIENT FILES\127490_McCloy_Group\20220611_BDAR_HaussmanDrive_May2021\Mapping\20220729_BDAR_Fig02_StudyArea_DevelopmentSite.mxd

1.4 Information Sources

The following information sources were utilised to inform the biodiversity development assessment which provided knowledge of existing literature pertaining to the Development Site and broader locality:

- The NSW DPE BioNet Vegetation Classification (formerly known as the NSW Vegetation Information System Classification Database) (DPE, 2022a).
- The NSW DPE Threatened Biodiversity Data Collection (formerly known as the Threatened Species Profile Database) (DPE, 2022b).
- The NSW DPE BioNet Atlas of NSW (formerly known as the NSW Wildlife Atlas) (DPE, 2022c).
- The Commonwealth Department of the Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) (DAWE, 2022a).
- The Commonwealth DAWE *Species Profile and Threats Database* (SPRAT) (DAWE, 2022b).
- Relevant published literature.

1.5 Legislative Context

Assessment of the proposed development was undertaken in accordance with and in consideration of the following Acts and Policies:

- Commonwealth:
  - *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- State:
  - *Biodiversity Assessment Method (DPIE, 2020a)*
  - *Biodiversity Conservation Act 2016* (NSW) (BC Act)
  - *Biodiversity Conservation Regulation 2017* (NSW) (BC Regulation)
  - *Environmental Planning and Assessment Act 1979* (EP&A Act)
  - *Biodiversity Conservation (Savings and Transitional) Regulation 2017*
  - *Biosecurity Act 2015*
  - *State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Chapter 3 (Koala Habitat Protection) 2020.*
- Local:
  - Maitland Local Environmental Plan 2011 (MLEP 2011)
  - Maitland Development Control Plan 2011 (MDCP 2011).

1.5.1 Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act assessment, an approval is required for actions that are likely to have a significant impact on matters of national environmental significance (MNES). An action includes a project, development, undertaking, activity, or series of activities. When a person proposes to take an action, they believe may need approval under the EPBC Act, they must refer the proposed development to the Australian Government Minister for the Environment. The Act identifies nine MNES:

1. World Heritage properties;
2. National heritage places;
3. Wetlands of international importance (Ramsar Convention);
4. Listed threatened species and communities;
5. Migratory species listed under international agreements;
6. Great Barrier Reef Marine Park;
7. Commonwealth marine areas;

8. Nuclear actions; and
9. Water resources in respect to Coal Seam Gas and large coal mines.

While this BDAR is not required to address MNES, the proponent is required to address the EPBC Act as part of their development application. Items 3, 4 and 5 are relevant to the current proposed development.

1.5.2 Biodiversity Conservation Act 2016 (NSW)

Biodiversity Assessment Pathway

As per Part 7.7 of the BC Act, all applications for development consent under Part 4 of the EP&A Act are to be accompanied by a BDAR[1] unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values. Part 7.2 of the BC Act states that a development is *likely to significantly affect threatened species* if it:

- Is carried out within an area of Outstanding Biodiversity Value, or
- Exceeds the Biodiversity Offset Scheme (BOS) thresholds, which includes:
    - Clearing of native vegetation, or undertaking a prescribed activity, on land mapped on the NSW Biodiversity Vales Map (BV Map), or
    - Clearing of native vegetation of an area declared by clause 7.2 of the BC Regulation as exceeding the threshold.
- Is likely to significantly affect threatened species or ecological communities, or their habitat, according to the test in section 7.3 (5-part test).

The proposed development does not occur within an area of Outstanding Biodiversity Value (AOBV).

The NSW biodiversity values map was reviewed, and there are no areas of biodiversity value mapped within the Study Area.

Under clause 7.2 of the BC Regulation, the area of native vegetation clearing threshold for the proposed development is 1 ha or more, as the minimum lot size of the Development Site is 40 ha. However, it is understood that the minimum lot size following rezoning (prior to subdivision/development) will be reduced to <1ha, such that the vegetation clearing threshold for entry into the BOS will be 0.25 ha. If this minimum lot size was applied, a streamline BDAR (small area module) could be undertaken if the vegetation clearing is equal to, or less than, 1 ha. The proposed development will directly impact on approximately 0.82 ha of native vegetation. As such, the proposed development exceeds the native vegetation clearing threshold set out in the BC Regulation, and a BDAR is required for the proposed development.

Biodiversity Assessment Method

Section 2.2 of the BAM (DPIE, 2020a) summarises the streamlined assessment modules that may be used by an assessor. These streamlined assessment modules may be used where the proposed development impacts on:

a) scattered trees (Appendix B of the BAM).
b) a small area (Appendix C of the BAM).

[1] With the exception of:
(a) an application for development consent for State significant development, or
(b) an application for a complying development certificate.

c) planted native vegetation, where the planted native vegetation was planted for purposes such as street trees and other roadside plantings, windbreaks, landscaping in parks and gardens, and revegetation for environmental rehabilitation (Appendix D of the BAM).

Appendices B, C and D of the BAM set out the circumstances where each of the streamlined assessment modules can be used to assess a proposal and the specific assessment requirements. Streamlined assessment modules cannot be used to assess clearing within areas mapped by the Biodiversity Values Map.

The proposed rezoning of land to residential comprises 0.82 ha of native vegetation. Any development within the future residential zoned land will have the potential to impact 0.82 ha of native vegetation. Given the minimum lot size of 1 ha, the small area module of the BAM (streamline BDAR) is applicable to the project.

The Biodiversity Accredited Assessor System (BAAS) Case number for the project is 00024274. The BAM Calculator number for the project is 00024274/BAAS18041/21/00025808.

1.5.3 Biosecurity Act 2015

Under the *Biosecurity Act 2015* all plants are regulated with a general biosecurity duty *"to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable."* Under the Act, a biosecurity impact is *"an adverse effect on the economy, environment, or the community that arises, or has the potential to arise, from a biosecurity matter."*

All matters of biosecurity identified during the assessment, including High Threat Weeds (HTW) and Weeds of National Significance (WoNS) have been considered within this report.

1.5.4 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) consolidates, transfers and repeals the provisions of eleven (11) SEPPs into a single environmental planning instrument. The Biodiversity and Conservation SEPP aims to promote the protection and improvement of key environmental assets for their intrinsic value and the social and economic benefits they provide. Relevant chapters of the Biodiversity and Conservation SEPP are considered below:

Chapter 3 - Koala Habitat Protection State Environmental Planning Policy (SEPP 2020)

This Chapter of the Biodiversity and Conservation SEPP incorporates the provisions of the now repealed Koala Habitat Protection SEPP 2020 (Koala SEPP 2020) and the Koala Habitat Protection SEPP 2021. The Koala Habitat Protection SEPP 2021 was made and commenced on 17 March 2021. The Koala SEPP 2021 reinstates the policy framework of SEPP Koala Habitat Protection 2019 to 83 Local Government Areas (LGA) in NSW; however, for all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and the Central Coast, Koala SEPP 2020 continues to apply.

The Koala SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline. The Koala SEPP 2021 applies to each Local Government Area listed in Schedule 1 of the SEPP. However, for all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and the Central Coast, Koala SEPP 2020 continues to apply.

The Study Area is zoned RU2 – Rural Landscape under the Maitland LEP 2011, as such, the provisions of the Koala SEPP 2020 apply. See Section **4.1.1.** for a summary of the Koala habitat assessment.

2 LANDSCAPE CONTEXT

2.1 LANDSCAPE FEATURES

The landscape features and site context detailed in Section 3 of the BAM (DPIE, 2020a) are described in **Table 1**. These landscape features are also shown in **Figure 3**.

Table 1 Landscape context of Subject Site (107 Haussman Drive, Thornton).

Landscape Feature	Development Site
IBRA bioregion	Sydney Basin IBRA Region
IBRA subregion	Hunter IBRA Sub-region
LGA	City of Maitland
Mitchell Landscapes	**Newcastle Coastal Ramp** This landscape occurs on undulating lowlands and low to steep hills on complex patterns of faulted and gently folded Carboniferous conglomerate, lithic sandstone, felspathic sandstone, and mudstone. General elevation 50 to 275m, local relief 40 to 150m. Stony red texture-contrast soils on steep slopes, yellow and brown texture-contrast soils on lower slopes and deep dark clay loams along streams (Mitchell, 2002).
Rivers, streams and estuaries	One first order stream starts within the Study Area and flows to the west, outside of the Study Area (**Figure 3**). The current development design of the Subject Site impacts the head of the stream.
Wetlands	The closest mapped wetlands are the Woodberry Swamp (Approx. 1.3km from the Development Site) and Tarro Swamp (Approx. 4.3km from the Development Site), which are mapped under the SEPP Coastal Management Act 2018 as Coastal Wetlands. Additionally, the Hunter Wetlands National Park, listed as a RAMSAR Wetland, occurs approximately 11.5km from the Development Site.
Connectivity of different areas of habitat	The Development Site occurs within the Thornton north residential area that has majority cleared of wooded vegetation. Limited connectivity to other areas of wooded vegetation exists due to the intersection of Raymond Terrace Road to the north, Haussman Drive to the south-west and high-density residential areas to the south-east. Large areas of wooded vegetation occur to the south-west of the Development Site, however, these areas have limiting connectivity to the Development Site due to Haussman Drive, the Railway corridor adjacent to Haussman Drive, and the New England Highway further to the south-west.
Areas of geological significance and soil hazard features	The Development Site occurs on Class 5 land as mapped under the Maitland Local Environmental Plan 2011, and therefore has a low risk of acid sulfate soils occurring within the site. Class 2 Acid Sulfate Soils are mapped approximately 1km away to the south-east of the Development Site.
Areas of outstanding biodiversity value	The Development Site does not occur on an area mapped as Outstanding Biodiversity Value, or within proximity to an area mapped as Outstanding Biodiversity Value.

2.2 SITE CONTEXT

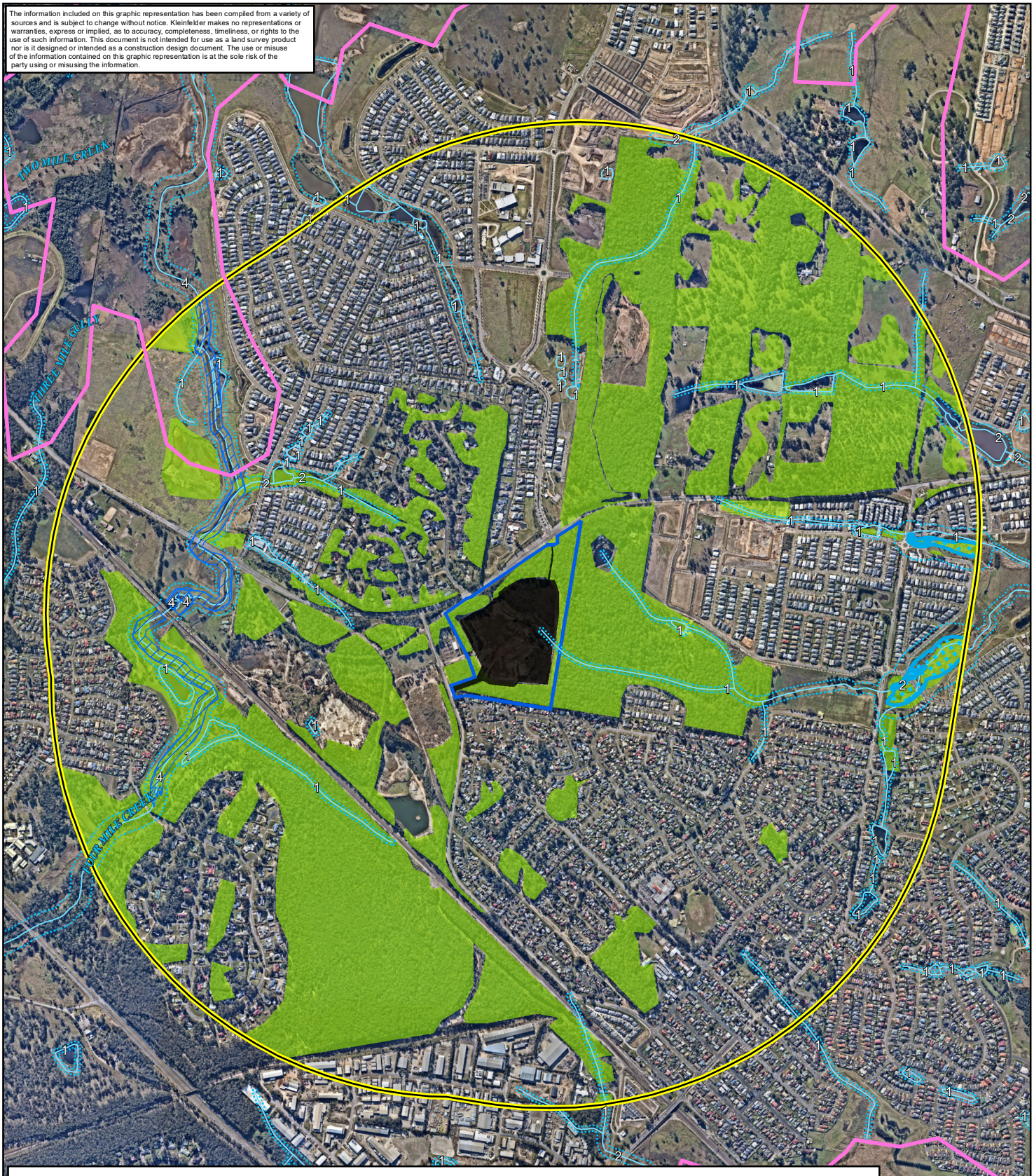
Details of the landscape assessment for the Development Site, according to the BAM (DPIE, 2020a) using the site-based assessment methodology and determined by remote sensing and GIS are detailed below.

2.2.1 Native Vegetation Cover

Native vegetation cover estimated to remain in the landscape proximal to the Development Site has been calculated within a 1,500 m site buffer. The 1,500 m site buffer area has a total area of 1022 ha, of which 329 ha is native vegetation. This equates to 32% native vegetation cover (**Figure 3**).

2.3 GEOLOGY AND SOILS

The Study Area is mapped as occurring on the Beresfield soil landscape (DPE, 2022f). The Beresfield soil landscape is described as occurring on undulating low hills and rises on Permian sediments in the East Maitland Hills region. Soils are typically moderately deep (<120 cm) Podzolic soils. The dominant materials are described as fine sandy-clay or silty loams. These soils are prone to water erosion and localised seasonal waterlogging in low lying areas can occur.



Legend

- Study Area
- DA17/2593 Approved (Excluded from this BDAR Assessment)
- Landscape Assessment - 1500m Buffer
- Landscape Assessment - Native Vegetation

Biodiversity Values (V11.4)

- Coastal Management Act - Wetlands
- Protected Riparian Land
- IBRA Sub-region Boundary (V7)
- Mitchell Landscapes Boundary (V3)
- Watercourse (Labelled with stream order)
- Riparian Buffers

km 0 0.1 0.2 0.4 0.6 0.8 1

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DATE DRAWN: 8/2/2022 09:42 Version 1

DRAWN BY: AMcDonaugh

DATA SOURCE:
NSW DFSI - 2020
NSW EOH - 2020
Nearmap - 2020

Site Location - Landscape Context

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Biodiversity Development Assessment Report
Lot 2 DP 1145348
Haussman Drive, Thornton NSW

FIGURE:

3

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3 NATIVE VEGETATION

3.1 METHODOLOGY

Native vegetation (**Figure 3**) at the Development Site was assessed in accordance with Section 4.2 of the BAM (DPIE, 2020a).

3.1.1 Data Review

Previous vegetation mapping within Lot 2 DP 1145348, completed as part of the Flora and Fauna Assessment Report (Kleinfelder, 2017) for a senior housing development, was reviewed in conjunction with plot-based surveys conducted as part of the current assessment.

3.1.2 Vegetation Mapping Surveys

Vegetation Mapping and Surveys

Detailed vegetation surveys were conducted across the Study Area on 12 and 26 May 2021. Areas of vegetation to be impacted by the amended development design were mapped during this period.

The ecotonal boundaries of each PCT within the development footprint were validated through ground-truthed surveys using a combination of rapid data points (RDPs) and vegetation boundary polygons. These attributes were collected in the field using a hand-held Trimble™ GPS unit. Additionally, aerial photographic interpretation (API) was used to aid in determining boundaries of PCTs within the Study Area.

Plant Community Type Determination

Each vegetation community identified within the Study Area was assigned to the closest equivalent PCT from those listed in the BioNet Vegetation Classification database (DPIE, 2020b). This was based on field data confirming dominant species present and floristic structure and composition within those vegetation communities. Other diagnostic features to aid in PCT classification included landscape position, soil type and descriptive attributes for those communities.

Relevant attributes of each PCT, such as floristic composition and structure, regional location, dominant species, etc, were assessed to determine if the vegetation within the Study Area is commensurate with known Threatened Ecological Communities (TECs) as defined by NSW (BC Act) and Commonwealth (EPBC Act) legislation.

Vegetation Zones

Vegetation zones were identified and delineated on the Development Site in accordance with Section 4.3 of the BAM (DPIE, 2020a). A vegetation zone is defined in the BAM as a relatively homogenous area that is the same vegetation type and broad condition. Vegetation zones identified within the Development Site are presented in Section 3.2.

Assessing Vegetation Integrity (Vegetation Condition)

Following stratification of the Development Site into vegetation zones, plots/transects were undertaken to collect site condition data for the composition, structure and function attributes listed in **Table 2** in accordance with Section 4.3 of the BAM (DPIE, 2020a). The location of the plots/transects were selected through stratified random sampling to provide a representative sample of the variation in vegetation composition and condition within each vegetation zone.

Table 2 Growth form groups and condition attributes used to assess the composition, structure and function components of vegetation integrity.

Condition attributes used to assess composition	Condition attributes used to assess structure	Attributes used to assess function
Tree richness	Tree cover	Number of large trees
Shrub richness	Shrub cover	Tree regeneration
Grass and Grass-like richness	Grass and Grass-like cover	Tree stem size classes
Forb richness	Forb cover	Total length of fallen logs
Fern richness	Fern cover	Litter cover
Other richness	Other r cover	High threat weed cover

Five (5) vegetation integrity plots were undertaken across the Development Site (**Figure 3**) which meets the minimum number of plots/transects required for each vegetation zone, based on their area, as detailed in Section 4.3.4, Table 3 of the BAM (DPIE, 2020a).

Floristic Identification and Nomenclature

Floristic identification and nomenclature were based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (http://plantnet.rbgsyd.nsw.gov.au).

3.2 Assessment Results

3.2.1 Vegetation within the Development Site

Vegetation Description

One PCT was identified within the Study Area (**Figure 4**); 1592 -Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter.

Table 3 Plant Community Types (PCTs) identified within the proposed R1 and E3 Zones.

Vegetation Zone	Vegetation Formation	Vegetation Class	PCT	Condition	R1 Area (ha)	E3 Area (ha)
1	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	1592 -Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	Regrowth Meets EEC determination	0.00	0.58
2	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	1592 -Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	Remnant - Moderate Meets EEC determination	0.50	4.23

Vegetation Zone	Vegetation Formation	Vegetation Class	PCT	Condition	R1 Area (ha)	E3 Area (ha)
3	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests	1592 -Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	Modified Meets EEC determination	0.32	0.27
				Subtotal	0.82	5.08
	-	-	Cleared	-	1.30	0.47
			Approved DA	-	11.27	0.00
				Total	13.39	5.55

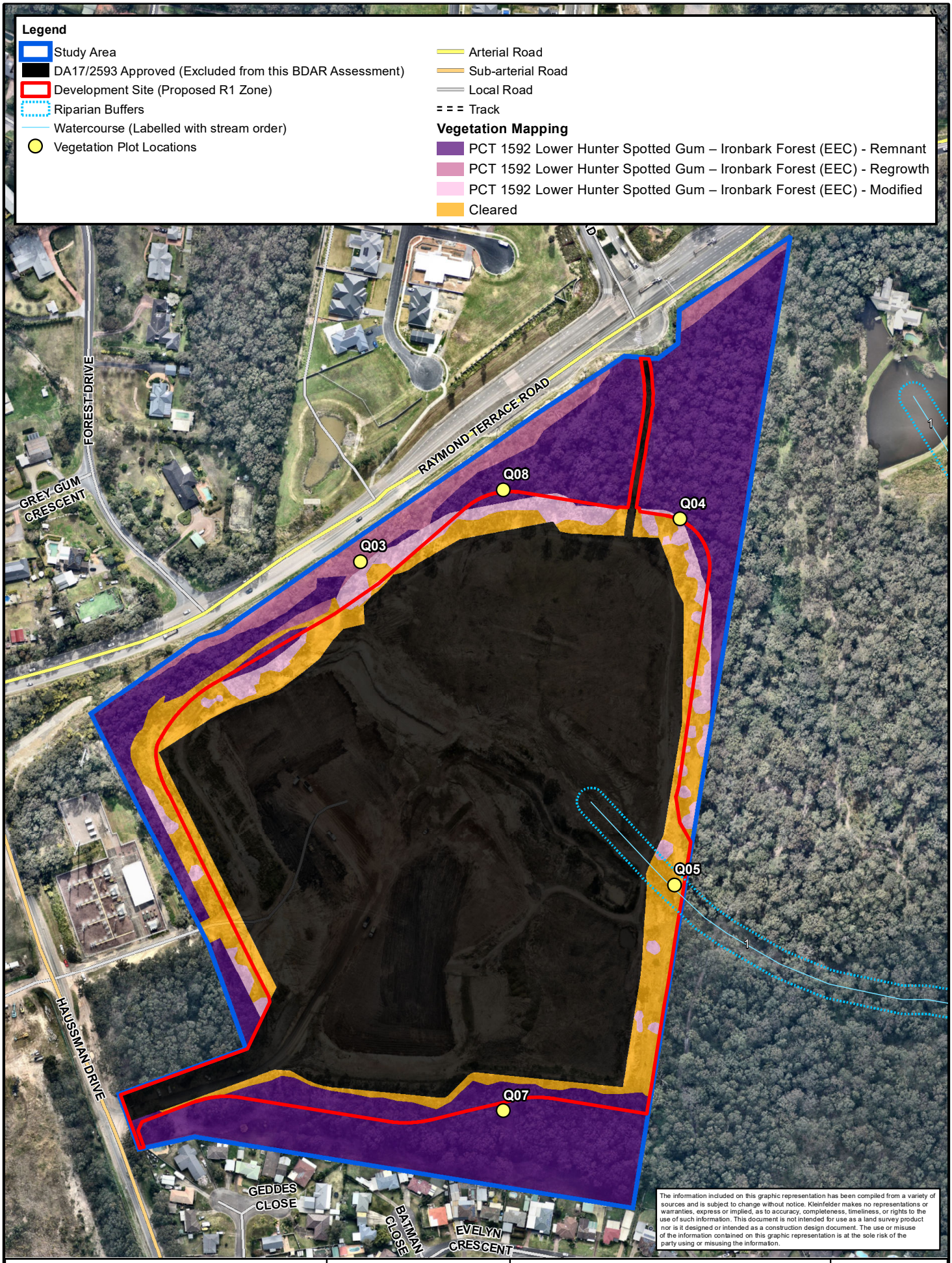
Threatened Ecological Communities (TECs)

Within the Development Site, Vegetation Zone 2 and 3 (0.82ha) is commensurate with the vegetation assemblage of one Endangered Ecological Community (EEC); *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* (hereafter referred to as Lower Hunter Spotted Gum Ironbark Forest) (**Figure 4**). Lower Hunter Spotted Gum Ironbark Forest occurs within the Sydney Basin IBRA region and typically occurs on Permian geology. The EEC is characterised by a dominant canopy stratum of *Corymbia maculata* (Spotted Gum) and *Eucalyptus fibrosa* (Red Ironbark), with a *Eucalyptus punctata* (Grey Gum) influence.

Vegetation Zones

The Plant Community Type within the Study Area is comprised of three (3) vegetation zones (**Figure 4**). Vegetation Zone 1 (zone 1) is considered to exist in a low/degraded condition within some evidence of regrowth occurring within the north-western strip of the Study Area. Vegetation Zone 2 (Zone 2) is considered to be in a moderate condition and occurs within the northern and southern portions of the Study Area. Vegetation Zone 3 (zone 3) is considered to be in a modified/managed condition due to APZ vegetation management associated with the approved DA.

Details on the vegetation zone (including condition class, area, patch size, survey effort and vegetation integrity score) are outlined in **Table 3** and full descriptions of each vegetation zone is provided in the following sub-sections **Figure 4** shows the distribution of vegetation zone within the Development Site. Plot data is provided in **Appendix H**.



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DRAWN BY: AMcDonaugh
DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2021

Vegetation Communities

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Biodiversity Development Assessment Report
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FIGURE:
4

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3.2.1.1 Vegetation Zone 1

Plate 1 Vegetation Zone 1

1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (Regrowth condition)	
Vegetation Formation and Class	Dry Sclerophyll Forests (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	0.00
Survey Effort	**Required:** 1 plots/transects
	Conducted: 1 plots/transects (Q03)

1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (Regrowth condition)	
Floristic description	This community occurs as an open forest with the mixture of canopy species. The most dominant species within this vegetation zone include *Eucalyptus punctata* (Grey Gum), *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus globoidea* (White Stringybark). The shrub layer is generally sparse within this community. Species such as *Ozothamnus diosmifolius* (White Dogwood), *Acacia fimbriata* (Fringed Wattle), *Breynia oblongifolia* (Coffee bush) and *Bursaria spinosa* (Native Blackthorn) were present throughout. The ground stratum varies within the area but is generally dominated by grasses such as *Themeda australis* (Kangaroo Grass), *Microlaena stipoides* (Weeping Grass) and *Entolasia stricta* (Wiry Panic). Forbs such as *Lobelia purpurascens* (Whiteroot), *Dichondra repens* (Kidney Weed), *Oxalis perennans* were also common.
Condition within Development Site	Vegetation within this zone is considered to be in degraded condition due to previous clearing and weed incursion. Regrowth is evident.
Justification for PCT selection	Although the canopy structure is slightly different to that of the moderate condition vegetation zone of PCT 1592, shrub species and ground cover species are commensurate with the PCT 1592. Therefore, PCT 1592 is considered the most appropriate PCT for this vegetation zone.
Status	**BC Act Listed – Endangered** *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*. The vegetation assemblage within this zone is commensurate with vegetation characteristic of this EEC. The Development Site is commensurate with descriptive attributes of this EEC, i.e., regional location, soil type and geology. **EPBC Act - Not Listed.**
SAII	No
PCT % Cleared	44 % (obtained from NSW BioNet Vegetation Classification)

3.2.1.2 Vegetation Zone 2

Plate 2: Vegetation Zone 2

1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (Remnant - Moderate condition)	
Vegetation Formation and Class	Dry Sclerophyll Forests (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	0.50
Survey Effort	**Required:** 2 plots/transects
	Conducted: 2 plots/transects (Q07 & Q08)

1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (Remnant - Moderate condition)	
Floristic description	This community occurs as an open forest with the canopy stratum dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Red Ironbark). *Eucalyptus punctata* (Grey Gum, *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus umbra* (Broad-leaved White Mahogany) are co-dominant species, depending on the area within the Development Site. Commonly encountered shrubs within this vegetation zone include *Ozothamnus diosmifolius* (White Dogwood), *Acacia fimbriata* (Fringed Wattle), *Acacia elongata* (Swamp Wattle) and *Bursaria spinosa* (Native Blackthorn) with minor occurrences of *Acacia falcata, Daviesia ulicifolia* (Gorse Bitter Pea) and *Pultenaea villosa* (Hairy Bush Pea). The ground stratum varies within the area but is generally dominated by grasses such as *Themeda australis* (Kangaroo Grass), *Microlaena stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic). Forbs such as *Gonocarpus teucrioides* (Raspwort), *Lobelia purpurascens* (Whiteroot) and *Dichondra repens* (Kidney Weed) were also common. *Cheilanthes sieberi* (Poison Rock Fern) was common in certain areas.
Condition within Development Site	Vegetation within this zone is considered to be in moderate condition.
Justification for PCT selection	PCT 1592 is considered the most appropriate PCT for the community present within the Development Site based on the dominant canopy species, *Eucalyptus fibrosa* (Red Ironbark) and *Corymbia maculata* (Spotted Gum) with an influence of *Eucalyptus punctata* (Grey Gum).
Status	**BC Act Listed – Endangered** *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*. The vegetation assemblage within this zone is commensurate with vegetation characteristic of this EEC. The Development Site is commensurate with descriptive attributes of this EEC, i.e., regional location, soil type and geology. **EPBC Act - Not Listed.**
SAII	No
PCT % Cleared	44 % (obtained from NSW BioNet Vegetation Classification)

3.2.1.3 Vegetation Zone 3

Plate 3 Vegetation Zone 3

1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (Modified/Managed condition)	
Vegetation Formation and Class	Dry Sclerophyll Forests (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests
Area within Development Site	0.32
Survey Effort	**Required:** 2 plots/transects
	Conducted: 2 plots/transects (Q04 & Q05)

1592 - Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (Modified/Managed condition)	
Floristic description	This community occurs as an open forest with the mixture of canopy species. The most dominant species within this vegetation zone include *Corymbia maculata* (Spotted Gum) *Eucalyptus punctata* (Grey Gum), *Eucalyptus fibrosa* (Red Ironbark). The shrub layer is generally sparse within this community. Species such as *Breynia oblongifolia* (Coffee bush) and *Bursaria spinosa* (Native Blackthorn) were present throughout. Scattered occurrences of *Ozothamnus diosmifolius* (White Dogwood) was evident within this community. The ground stratum varies within the area but is generally dominated by grasses such as *Microlaena stipoides* (Weeping Grass) and *Entolasia stricta* (Wiry Panic). An influence of *Themeda triandra* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass) and *Aristida vagans* (Three-awn Spear grass) was present. Forbs such as *Lobelia purpurascens* (Whiteroot) and *Arthropodium milleflorum* (Pale Vanilla-lily) and the fern *Cheilanthes sieberi* were also evident throughout.
Condition within Development Site	Vegetation within this zone is considered to be in moderate condition due to previous clearing and weed incursion.
Justification for PCT selection	PCT 1592 is considered the most appropriate PCT for the community present within the Development Site based on the dominant canopy species, *Eucalyptus fibrosa* (Red Ironbark) and *Corymbia maculata* (Spotted Gum) with an influence of *Eucalyptus punctata* (Grey Gum).
Status	**BC Act Listed – Endangered** *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*. The vegetation assemblage within this zone is commensurate with vegetation characteristic of this EEC. The Development Site is commensurate with descriptive attributes of this EEC, i.e. regional location, soil type and geology. **EPBC Act - Not Listed.**
SAII	No
PCT % Cleared	44 % (obtained from NSW BioNet Vegetation Classification)

Assessment of Patch Size

The patch size for Vegetation Zone 1, 2 and 3 were assessed as >100 ha as this zone is connected to large intact areas of native vegetation extending to the east, south and west, any gaps in the vegetation patch are less than 100 m.

Vegetation Integrity Score

The current vegetation integrity score of the vegetation zones is outlined in **Table 4**.

Table 4 Condition scores and current Vegetation Integrity (VI) scores of each vegetation zone within the development footprint (proposed R1 Zone).

Zone	PCT	Condition Class	Area (ha)	Condition scores (Current Score)			Vegetation Integrity Score
				Composition	Structure	Function	
1	1592	Regrowth	0.00	72.8	39.2	49	51.9
2	1592	Remnant	0.5	81.4	22.7	44.8	43.6
3	1592	Modified	0.32	84.1	43.5	44.5	54.6

3.2.2 Vegetation within the Study Area

The vegetation within the Study Area is floristically consistent with *PCT 1592: Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter*. A large portion of the Study Area consists of previously cleared vegetation, pertaining to an approved DA. This vegetation within this area occurs as a managed form of PCT 1592. Species observed within these areas that differ from the current Subject Site consist of *Andropogon virginicus* (Whisky Grass), *Gonocarpus tetragynus* (Raspwort), *Dillwynia retorta, Pultenaea spinosa, Leucopogon juniperinus* (Prickly Beard-heath), *Goodenia paniculata, Acacia irrorata* (Green Wattle), *Acacia parvipinnula* (Silver-stemmed Wattle), *Casuarina glauca* (Swamp She-oak) and *Typha orientalis* (Broad-leaved Cumbungi). The main floristic difference within this part of the Study Area in comparison to the Subject Site is the limited overstorey vegetation and large areas dominated by Whisky Grass. **Plate 4** and **Plate 5** displays the vegetation condition within this part of the Study Area.

Plate 4 **Condition of vegetation within cleared sections of the Study Area.**

Plate 5 **Patches of Whisky Grass (*Andropogon virginicus*) dominating parts of the Study Area.**

4 THREATENED SPECIES

4.1 ASSESSING HABITAT SUITABILITY

To help inform the assessment of suitable habitat for threatened species and populations within the Study Area, a database search of the NSW Department of Planning and Environment (DPE) BioNet Atlas and the Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) were conducted. Results are provided in **Appendix A**. A site-based survey assessing the suitability of threatened flora and fauna species habitat was undertaken on 12 and 26 May 2021. This assessment id detailed in the Section 4.1.1.

4.1.1 Habitat Assessment

Flora

A BioNet Atlas search of the area returned five (5) threatened flora species recorded within the locality, of which, one species, *Callistemon linearifolius* (Netted Bottled Brush), was considered to have a moderate likelihood of occurring within the Study Area. Based on the findings of the previous Flora and Fauna Assessment Report (Kleinfelder, 2017) and the site surveys, undertaken on 12 and 26 May 2021, no threatened species were identified to occur within the Development Site. Therefore, the vegetation within the Development Site is unlikely to support habitat for threatened flora species.

Fauna

Habitat Assessment

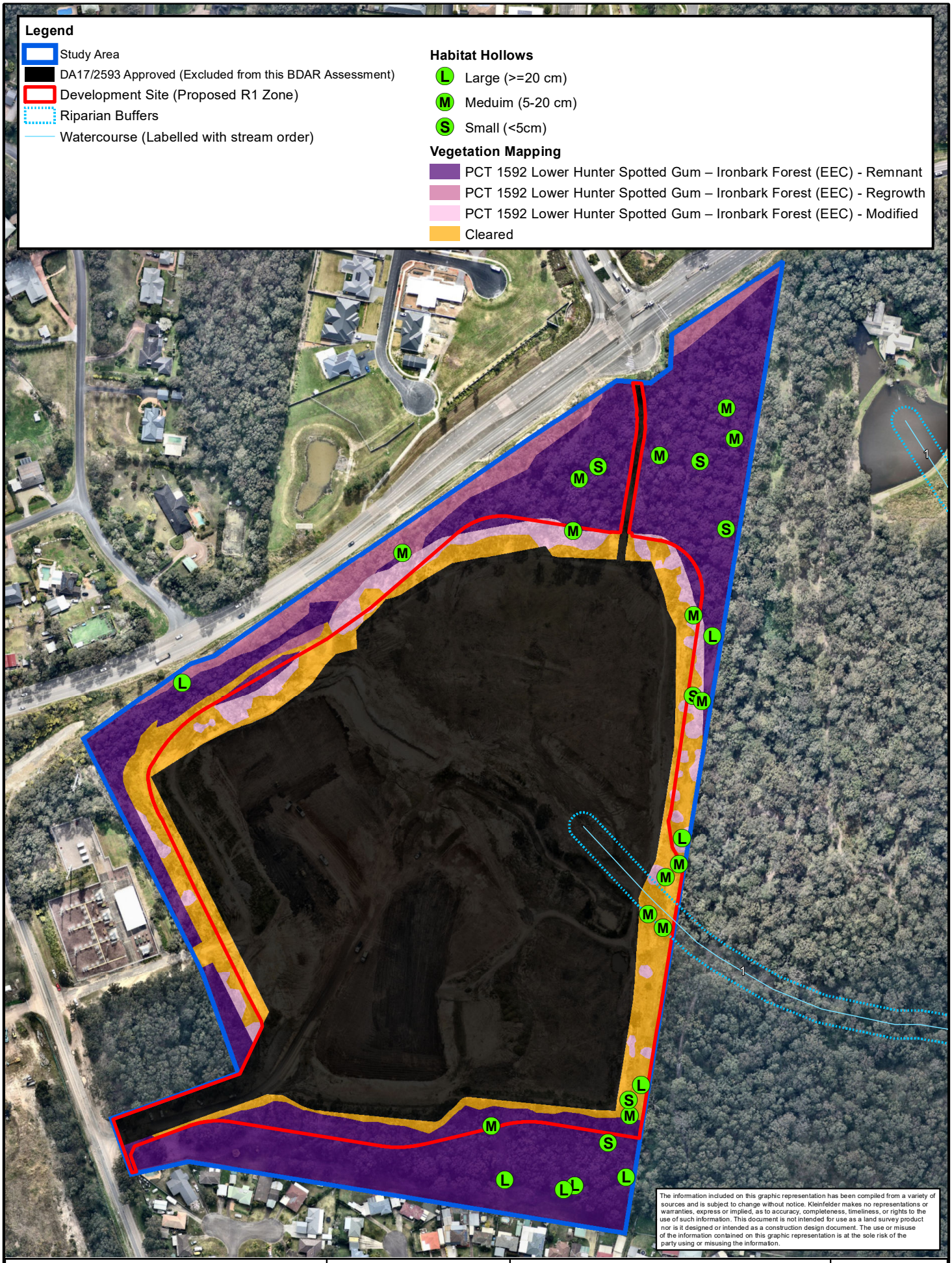
A BioNet Atlas search, applying a 5-kilometre buffer to the Development Site, returned 53 threatened fauna species within the locality. Based on site surveys conducted on 12 and 26 May 2021, and previous records of threatened fauna species (Kleinfelder, 2017), the Development Site is likely to contain suitable habitat for the following fauna species:

- Little Lorikeet (*Glossopsitta pusilla*)
- Grey-crowned Babbler (eastern sub-species) (*Pomatostomus temporalis temporalis*)
- Squirrel Glider (*Pteropus norfolkensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)

Habitat Tree Survey

A ground-based survey of habitat trees within the Study Area was undertaken on 26 May 2021 to validate the number and size of hollows previously identified in 2017 (Kleinfelder, 2017) and identify additional hollow-bearing trees, dead standing stags and trees containing nests. The results of the habitat tree survey are used to determine the suitability of hollows for hollow-dependent threatened fauna species likely to occur within the Study Area.

A total of 26 hollow-bearing trees are located within the Study Area with ten (10) being located within the proposed R1 Zone. Within the proposed R1 Zone, there is one (1) hollow-bearing tree containing a large hollow and nine (9) containing medium-sized hollows (**Figure 5**).



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PROJECT REFERENCE: 20220611
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DRAWN BY: AMcDonaugh
DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2021

Habitat Features

McCloy Group
Biodiversity Development Assessment Report
Lot 2 DP 1145348
Haussman Drive, Thornton NSW

FIGURE:
5

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Koala Habitat

Vegetation within the Study Area and Subject Site does not meet the definition of 'Potential' Koala habitat as defined by SEPP 2020, due to a lack of listed Koala feed tree species (according to Schedule 2 of the SEPP 2020). *Eucalyptus punctata* comprised less than 15% total cover of species. In addition, there are no BioNet atlas records of Koalas within 2.5 kilometres of the Study Area within the last 18 years indicating that the area lacks a resident Koala population. As such, the vegetation within the Study Area does not meet the definition of 'Core' Koala habitat under the Koala SEPP 2020.

4.1.2 Ecosystem Credit Species

The following assessment of habitat suitability for ecosystem credit species was conducted in accordance with Section 5.2 of the BAM. Ecosystem credits represent threatened species that can be predicted to be present by the type and condition of vegetation at the Subject Site. Targeted survey is not required for ecosystem credit species.

Step 1: Identify threatened species for assessment.

A list of predicted ecosystem credit species for the Subject Site was reviewed in the BAM calculator, according to PCTs present on the subject land.

Step 2: Assessment of the habitat constraints and vagrant species on the subject land

The potential for identified ecosystem credit species to occur on the Subject Site was assessed according to species specific habitat requirements, as detailed in **Table 5**.

Table 5 Assessment of ecosystem credit species within the Subject Site.

Scientific Name	Common Name	Confirmed predicted species	Justification
Anthochaera phrygia	Regent Honeyeater	Yes	-
Callocephalon fimbriatum	Gang-gang Cockatoo	Yes	-
Calyptorhynchus lathami	Glossy Black-cockatoo (foraging)	Yes	-
Chthonicola sagittata	Speckled Warbler	Yes	-
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Yes	-
Daphoenositta chrysoptera	Varied Sittella	Yes	-
Dasyurus maculatus	Spot-tailed Quoll	Yes	-
Falsistrellus tasmaniensis	Eastern False Pioistrelle	Yes	-
Glossopsitta pusilla	Little Loriket	Yes	-
Grantiella picta	Painted Honeyeater	Yes	-

Scientific Name	Common Name	Confirmed predicted species	Justification
Haliaeetus leucogaster	White-bellied Sea-eagle	Yes	-
Hieraaetus morphnoides	Little Eagle	Yes	-
Lathamus discolor	Swift Parrot	Yes	-
Lophoictinia isura	Square-tailed Kite	Yes	-
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Yes	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Yes	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Yes	-
Miniopterus australis	Little Bent-winged Bat	Yes	-
Miniopterus orianae oceanensis	Large Bent-winged Bat	Yes	-
Neophema pulchella	Turquoise Parrot	Yes	-
Ninox connivens	Barking Owl	Yes	-
Ninox strenua	Powerful Owl	Yes	-
Petaurus australis	Yellow-bellied Glider	Yes	-
Petroica boodang	Scarlet Robin	Yes	-
Phascolarctos cinereus	Koala (foraging)	Yes	-
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Yes	-
Pteropus poliocephalus	Grey-headed Flying-fox	Yes	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Yes	-
Scoteanax rueppellii	Greater Broad-nosed Bat	Yes	-
Stagonopleura guttata	Diamond Firetail	Yes	-
Tyto novaehollandiae	Masked Owl (foraging)	Yes	-

4.1.3 Species Credit Species

Step 1: Identify threatened species for assessment.

A list of predicted Species Credit Species for the Development Site was reviewed in the BAM calculator. Species credits pertain to threatened species that cannot be predicted by the vegetation present within the Subject Site.

Step 2: Assessment of the habitat constraints and vagrant species on the subject land; and

Step 3: Identify Candidate Species Credit species for further assessment.

The potential for identified Species Credit Species to occur on the Development Site was assessed according to species specific habitat requirements, as detailed in **Table 6**. Where woodland habitat features were not present due to the degraded condition of the site vegetation, Species Credit Species were determined to not be candidate species and no further assessment was required (**Table 6**).

No candidate species were identified as potential entities for a Serious and Irreversible Impact (SAII).

Table 6 Species Credit Species identified as Candidate Species.

Scientific Name	Common Name	Confirmed Candidate Species	Justification
Anthochaera phrygia	Regent Honeyeater	**No**	**Vegetation within the Subject site not mapped as important habitat for this species.**
Chalinolobus dwyeri	Large-eared Pied Bat	**No**	**Subject Site not within 2km of caves, cliffs, overhangs, escarpments or tunnels**
Lathamus discolor	Swift Parrot	**No**	**Vegetation within the Subject Site not mapped as important habitat for this species.**
Miniopterus australis	Little Bent-winged Bat	**No**	**No caves, tunnels, mines or culverts within the Subject Site or Study Area.**
Miniopterus orianae oceanensis	Large Bent-winged Bat	**No**	**No caves, tunnels, mines or culverts within the Subject Site or Study Area.**
Persoonia pauciflora	North Rothbury Persoonia	**No**	**Subject Site not within 10km of North Rothbury.**
Petrogale penicillata	Brush-tailed Rock-wallaby	**No**	**Subject Site not within 1km of rocky outcrops, gorges or escarpments.**

Scientific Name	Common Name	Confirmed Candidate Species	Justification
Vespadelus troughtoni	Eastern Cave Bat	**No**	**Subject Site not within 2km of caves, cliffs, overhangs, escarpments or tunnels**

4.1.4 Threatened Flora and Fauna Survey Results

No threatened flora or fauna species were identified within the Subject Site during the site assessment. A list of species identified during the surveys is provided in **Appendix 2**.

Weather Data

Weather data for the survey period is summarised per month in **Table 7**. Temperature rainfall data retrieved from Maitland Airport AWS (061428).

Table 7 Weather data experienced during the site assessment. Weather data collected from Maitland Airport AWS (Station 061428).

Date	Temps.		Rain	9am				3pm			
	Min.	Max.		Temp.	RH	Dir.	Spd.	Temp.	RH	Dir	Spd.
	°C	°C	(mm)	°C	%	Km/h		°C	%	Km/h	
12/05	11.8	22.0	8.2	14.8	80	WNW	8	20.9	71	S	11
26/05	7.4	23.0	0	15.8	70	NNW	4	22.5	46	WNW	17

5 AVOID AND MINIMISE IMPACTS ON BIODIVERSITY VALUES

5.1 AVOIDING AND MINIMISING IMPACTS DURING PROJECT PALNNING

5.1.1 Avoid and Minimise Impacts on Native Vegetation and Habitat

The proposed Residential (R1) zoning largely encompasses areas subject to an existing approved DA, including APZs. The vast majority (4.23 ha or 89%) of higher-quality remnant Lower Hunter Spotted Gum – Ironbark Forest (EEC) is being retained and is proposed to be zoned Environmental Management (E3). These areas support higher quality habitats suitable for threatened species. In addition, sixteen hollow-bearing trees (62%) of all hollow-bearing trees within the Study Area are to be located within the proposed E3 zone.

The extent of the proposed R1 zone has undergone multiple iterations to ensure ecological connectivity is maintained within the site and to adjacent land. Specifically, an assessment of the importance of various corridors through the site was undertaken (RPS 2020). This assessment showed that, while connectivity around the western and northern boundary of the Study Area serves as a valuable ecological corridor, the strip of vegetation along the southern boundary of the Study Area was likely to be of greater importance to maintain fauna movement from land in the south-west to land in the east/north-east. Subsequently, a wider strip of intact bushland has been retained along the southern boundary (to be zoned E3), in addition to retained areas of bushland around the western, northern and eastern extents (also to be zoned E3). The retention of the areas will ensure that connectivity internally and externally to the site will be maintained.

The site is mapped as Category 1 land in the Maitland Urban Settlement Strategy. The site is considered to have high strategic merit and strong site specific merit for rezoning for residential purposes. Rezoning and development of the site for residential purposes reflects the highest and best use of land already highly disturbed due to its previous use as a quarry.

5.2 ASSESSMENT OF IMPACTS

5.2.1 Impacts on Native Vegetation and Habitat

5.2.1.1 Direct Impacts

The proposed rezoning will have the potential to impact all vegetation within the Development Site (proposed R1 Zone). The area of native vegetation within the proposed R1 totals 0.82 ha. Each vegetation zone equates to one management zone, and the future value of each attribute (composition, structure, and function) and the vegetation integrity score for all management zones will be zero.

5.2.1.2 Indirect Impacts

The proposed development has the potential for indirect impacts on the E3 Zone surrounding the proposed R1 Zone. Potential indirect impacts include:

- Increased weed invasion and potential spread or introduction of pathogens from the site to nearby vegetation
- Erosion and sedimentation into nearby vegetation
- Reduced viability of adjoining habitats due to increased noise, dust or light spill during operational phase
- Increase in rubbish dumping in adjoining habitats
- Accidental clearing

- Predation/exclusion of native fauna by domestic animals.

Provided appropriate mitigation measures and management plans are adhered to, it is unlikely to have a significant long-term effect on threatened species, ecological communities and their habitats.

5.2.2 Prescribed Impacts

The proposed development is not considered to have the potential to impact on any prescribed impacts.

5.3 Mitigating and Managing Impacts on Biodiversity Values

The measures outlined in **Table 8** should be adhered to prior and during vegetation clearing to ensure that impacts are minimised.

Table 8: Summary of direct, prescribed and indirect impacts of the proposed development.

Impact	Action and Outcome	Responsibility	Timing
• Direct impact / prescribed impact			
Clearing of native vegetation	• Clearing boundaries (R1/E3 Zone) should be clearly marked prior to clearing works (i.e., no-go exclusion fencing and signage). Permanent fencing is to be installed following vegetation clearing. • Ensure vehicle and equipment parking areas and stockpile areas are identified and positioned to avoid areas containing ecological value. • Identify and communicate the location of any 'no go zones' in site inductions.	Construction site manager	Prior to and during vegetation clearing
Vehicle collision with fauna	• Speed limits within the Development Site should be limited to 40 km/hr. • Driving during dawn and dusk to be avoided where practicable.	Construction site manager	During vegetation clearing and construction
Indirect Impact			
Transfer of weeds and pathogens to and from site	• The fungal pathogens *Phytophora cinnamomi* and Myrtle Rust (*Puccinia psidii*) are known to occur in the LGA however, it is unknown if they occur within the Development Site. These pathogens can have devastating impacts on native plant communities and inhabiting fauna if not properly managed. • Vehicle movements restricted to bitumen road and a haul road through the site. • All soil and seed material from site to be disposed of at landfill (no dumping in adjacent areas).	Construction site manager	During vegetation clearing and construction
Increase in dust, light and noise during clearing works	• Impacts from operational activities, such as disturbance to an animal's normal behaviour patterns due to noise, vibration, lighting or dust may cause surrounding areas of previously suitable habitat to become sub-optimal and may cause fauna species to vacate areas of previously suitable habitat.	Construction site manager	During vegetation clearing and construction

Impact	Action and Outcome	Responsibility	Timing
	• Construction works to be limited to daylight hours. • Reduce machinery noise where possible during clearing. • Dust suppression measures such as water to be utilised as necessary.		
Erosion and sedimentation	• Erosion and sedimentation mitigation measures to be put in place prior to commencement clearing works to prevent sedimentation into off site areas (e.g., bunds or sediment fencing).	Construction site manager	Prior to commencement of works.
Waste	• Waste management procedures to be identified prior to commencement of works. • Spill Response Procedures to be in place and spill kits to be present during clearing works. • All general waste to be removed from site.	Construction site manager	Prior to and during tree clearing.
Accidental Clearing	• Permanent fencing along R1/E3 boundary	Construction site manager	Prior to and during tree clearing.
Disturbance by domestic animals	• Permanent fencing along R1/E3 boundary	Construction site manager	Prior to and during tree clearing.

6 IMPACT SUMMARY

6.1 SERIOUS AND IRREVERSIBLE IMPACTS

No species at risk of Serious and Irreversible Impact (SAII) were identified during the study.

6.2 IDENTIFICATION OF IMPACTS REQUIRING OFFSETS

This section provides an assessment of the impacts requiring offsetting in accordance with Section 10.1 of the BAM (DPIE, 2020a).

6.2.1 Impacts on Native Vegetation

A summary of the impacts on native vegetation and the required ecosystem credit is provided in Table 9. The vegetation integrity score threshold is >17, therefore impacts to vegetation Zone 1 are required to be offset.

Table 9: Summary of ecosystem credit requirements

Vegetation Zone	Vegetation Zone Name	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Credits Required
1	VZ1 - 1592_regrowth	0.00	51.9	51.9	0
2	VZ2 – 1592 remnant	0.50	43.6	0	9
3	VZ3 – 1592 modified	0.32	54.6	0	11
				Total Credit Requirement	**20**

The Biodiversity Credit Reports (like-for-like and variation options) is provided in **Appendix E**.

7 ASSESSMENT OF OTHER BIODIVERSITY LEGISLATION

7.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

A database search of relevant threatened species databases and an assessment of the likelihood of occurrence of threatened and migratory species is provided in **Appendix A**. No threatened or migratory species, or ecological communities listed under the EPBC Act were identified within the Development Site. One species, Grey-headed Flying-fox, was assessed as having a moderate likelihood of occurrence due to suitable foraging habitat within the site. No breeding camps are located in proximity to the site. As the proposed rezoning only has the potential to impact a small area of foraging habitat for this highly mobile species, it is unlikely there will be a significant impact on these species. As such, a referral to the Commonwealth Minister for the Environment is not considered necessary.

7.2 BIOSECURITY ACT 2015

Species which require control prior to and post construction to ensure they are not spread due to works, include the high threat species listed in **Table 10**.

Table 10: Weed species requiring control within the Development Site

Scientific Name	Common Name	Weeds of National Significance (WONS)	Priority weeds of the Maitland LGA (Biosecurity Act)	High Threat Weeds (BAM)
Andropogon virginicus	Whisky Grass	-	-	✓
Asparagus aethiopicus	Asparagus Fern	✓	✓	✓
Bidens pilosa	Cobbler's Pegs	-	-	✓
Chloris gayana	Rhodes Grass	-	-	✓
Cortaderia selloana	Pampas Grass	-	✓	✓
Cyperus eragrostis	Umbrella Sedge	-	-	✓
Lantana camara	Lantana	✓	✓	✓
Paspalum dilatatum	Paspalum	-	-	✓
Senecio madagascariensis	Fireweed	✓	✓	✓
Senna pendula var. glabrata		-	-	✓
Triadica sebifera	Chinese Tallowood	-	-	✓

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APPENDIX A THREATENED SPECIES DATABASE SEARCH

THREATENED SPECIES DATABASE SEARCH

A list of threatened species, populations and ecological communities that have been reported or modelled to occur from within a five-kilometre radius of the Study Area was obtained from the following databases:

- NSW Department of Planning and Environment (DPE) BioNet Atlas: (http://www.bionet.nsw.gov.au/).
- Protected matter database search tool (https://www.environment.gov.au/epbc/protected-matters-search-tool)

An assessment was then made of the likelihood of the threatened species, populations, and / or ecological communities reported or modelled to occur in the locality occurring within the Study Area or using the habitat within the Study Area as an essential part of a foraging range.

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the Study Area based on the habitat requirements of each species. A brief definition of the likelihood of occurrence criteria is provided below:

- Known – species identified within the site during surveys.
- High – species known from the area (DPIE Wildlife Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site.
- Moderate – species may be known from the area, potential habitat is present within the site.
- Low – species not known from the area and/or marginal habitat is present within the site.
- Nil – habitat requirements not met for this species within the site.

Note: Marine species identified within the desktop assessment i.e. marine bird species, have been excluded from the list based on obvious habitat constraints. However, indirect impacts on these species and ecological communities have been considered.

Table A1 'Likelihood of Occurrence' table

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
Flora								
1.	*Acacia bynoeana* Bynoe's Wattle	E	V	0	PMST	The species is endemic to central eastern NSW, currently known from only 30 locations, many of only 1-5 plants. Grows mainly in heath/ dry sclerophyll forest on sandy soils, prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches.	Low	Marginally suitable habitat within the Study Area. No known records within the locality.
2.	*Angophora inopina* Charmhaven Apple	V	V	0	PMST	This species is endemic to the central coast region of NSW and is known to occur in four main vegetation communities: *Eucalyptus haemastoma / Corymbia gummifera / Angophora inopina* woodland / forest; *Hakea teretifolia / Banksia oblongifolia* wet heath; *Eucalyptus resinifera / Melaleuca sieberi / Angophora inopina* sedge / woodland; and *Eucalyptus capitellata / Corymbia gummifera / Angophora inopin*a woodland / forest elegans. Flowering generally poor and sporadic.	Not present	This species was not identified during the assessment.
3.	*Arthraxon hispidus* Hairy-joint Grass	V	V	0	PMST	The species has been recorded from scattered locations throughout Queensland and on the northern tablelands and north coast of NSW. Hairy-joint Grass is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps as well as woodland.	Nil	Habitat not suitable within the Study Area. No known records within the locality.
4.	*Asperula asthenes* Trailing Woodruff	V	V	0	PMST	This small herb occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. Occurs in damp sites, often along river banks.	Nil	No suitable habitat within the Study Area. No known records within the locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
5.	*Caladenia tessellata* Thick Lip Spider Orchid	E	V	0	PMST	In NSW this species is found sporadically on the coast from Swansea and extends onto the Tablelands further south. *Caladenia tessellata* is normally found on clay or sandy soils in grassy sclerophyll woodlands, although it has been recorded on stony soil. The species is now known with certainty from only two populations on the NSW Southern Tablelands.	Nil	Marginally suitable habitat within the Study Area. No known records within the locality.
6.	*Callistemon linearifolius* Netted Bottlebrush	V	-	253	BioNet	This shrub grows up to 3-4 m tall, with red flowers that are clustered into the typical "bottlebrushes". The species grows in dry sclerophyll forest on the coast and adjacent ranges.	**Moderate**	Potentially suitable habitat within the Study Area, however, species was not identified during the assessment. No records in proximity to the Study Area.
7.	*Commersonia prostrata* Dwarf Kerrang	E	E	0	PMST	Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (*Eucalyptus pauciflora*) Woodland and Ephemeral Wetland floor at Rowes Lagoon; Blue leaved Stringybark (*E. agglomerata*) Open Forest at Tallong; and in Brittle Gum (*E. mannifera*) Low Open Woodland at Penrose; Scribbly Gum (*E. haemostoma*)/ Swamp Mahogany (*E. robusta*) Ecotonal Forest at Tomago.	Nil	No suitable habitat within the Study Area. No known records within the locality
8.	*Cryptostylis hunteriana* Leafless Tongue-orchid	V	V	0	PMST	In New South Wales the species occupies a variety of habitats. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*). The species grows most often on the flat plains close to the coast, favouring moist soils.	Nil	No suitable habitat within the Study Area.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
9.	*Cynanchum elegans* White - flowered Wax Plant	E	E	0	PMST	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; *Leptospermum laevigatum* (Coastal Tea-tree) – *Banksia integrifolia* subsp. *integrifolia* (Coastal Banksia) coastal scrub; *Eucalyptus tereticornis* (Forest Red Gum) aligned open forest and woodland; *Corymbia maculata* (Spotted Gum) aligned open forest and woodland; and *Melaleuca armillaris* scrub (Bracelet Honeymyrtle) to open scrub.	Nil	No suitable habitat within the Study Area.
10.	*Dichanthium setosum*	V	V	0	PMST	Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Low	Marginally suitable habitat in cleared areas of the Study Area. No known records within the locality.
11.	*Eucalyptus camaldulensis* Endangered population in the Hunter	E2	-	1	BioNet	In NSW, Eucalyptus camaldulensis occurs along the western flowing rivers but is known from only one coastal catchment, the Hunter. The western-most individuals in the Hunter are at Bylong, south of Merriwa, and the most easterly at Hinton, on the bank of the Hunter River, in the Port Stephens local government area. It has been recorded in the local government areas of Lithgow, Maitland, Mid-Western Regional, Muswellbrook, Port Stephens, Singleton and Upper Hunter.	Not present	Species not identified to occur within the Study Area during the assessment.
12.	*Eucalyptus glaucina* Slaty Red Gum	V	V	0	PMST	A medium-sized tree to 30 m tall. The bark is smooth and mottled white to slaty grey. Produces flowers that a usually white but occasionally pink. Grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Not present	Species not identified during the assessment.
13.	*Eucalyptus parramattensis subsp. decadens* Earp's Gum	V	V	0	PMST	Occurs in low-lying, often swampy areas and in woodlands with associates such as *Eucalyptus racemosa* (Narrow-leaved Scribbly Gum), *E. globoidea* (White Stringybark) and *Angophora bakeri* (Narrow-leaved Apple) on poor sandy soils.	Not present	Species not identified during the assessment.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
14.	*Euphrasia arguta*	CE	CE	0	PMST	Known from Nundle State Forest and adjacent private land, in New South Wales. The species is known from three locations in two areas approximately 14 km apart. Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State Forest.	Nil	Unsuitable habitat within the Study Area.
15.	*Grevillea parviflora* subsp. *parviflora* Small-flower Grevillea	V	V	0	PMST	The species occurs in heath and shrubby woodland, in sandy or lightly clay soils usually over thin shales.	Nil	Species not identified during the assessment.
16.	*Maundia triglochinoides*	V	-	3	BioNet Atlas	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	Low	No suitable habitat for this species occurs within the Development Site. Potential suitable habitat may occur within damp areas and artificial water bodies within the Study Area.
17.	*Melaleuca biconvexa* Biconvex Paperbark	V	V	0	PMST	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Nil	Species not identified during the assessment.
18.	*Persicaria elatior* Tall Knotweed	V	V	0	PMST	Grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Nil	Habitat not suitable within the Study Area. No records within the locality.
19.	*Phaius australis*	E	E	0	PMST	Distribution has been tentatively described as being north from Lake Cathie but mainly north of the Evans Head area to the Barron River in northeast Queensland. Commonly associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany is found.	Nil	Habitat for this species is not present within the Study Area. No records within the locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
20.	*Pomaderris brunnea* Rufous Pomaderris	E	V	0	PMST	Shrub growing up to 3 m tall with distinctly hairy stems. The species occurs in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. Habitat for this species includes moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Nil	Habitat not suitable for this species within the Study Area. No records within the locality.
21.	*Prasophyllum sp. Wybong (C.Phelps ORG 5269)* (EPBC Act) / *Prasophyllum petilum* (BC Act) A Leek-orchid	V	CE	0	PMST	Known from open eucalypt woodland and grassland.	Nil	Habitat not suitable within the Study Area for this species. No records within the locality.
22.	*Pterostylis gibbosa* Illawarra Greenhood	E	E	0	PMST	In the Hunter region, this species grows in open woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *E. tereticornis* (Forest Red Gum) and *Callitris endlicheri* (Black Cypress Pine).	Nil	No suitable habitat within the Study Area. No records within the locality.
23.	*Rhizanthella slateri* Underground Orchid	V	E	0	PMST	The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Low	Marginally suitable habitat within the Study Area. No known records within the locality.
24.	*Rhodamnia rubescens* Scrub Turpentine	-	E	2	BioNet Atlas	Often found in wet sclerophyll associations in rainforest transition zones and creek side riparian vegetation. The species occupies a range of volcanically derived and sedimentary soils and is also a common pioneer species in eucalypt forests.	Low	No suitable habitat present within the Study Area. Species not identified during the assessment.
25.	*Rhodomyrtus psidioides* Native Guava	E4	-	4	BioNet Atlas	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	Low	No suitable habitat present within the Study Area. Species not recorded during the assessment.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
26.	*Rutidosis heterogama* Heath Wrinklewort	V	V	0	PMST	Grows in dry sclerophyll forests, native grasslands, grassy woodlands and heathlands.	Low	Marginally suitable habitat present within the Study Area. No known records within the locality.
27.	*Syzygium paniculatum* Magenta Lilly Pilly	E	V	0	PMST	Grows on sandy soils in subtropical and littoral rainforest near the coast from Bulahdelah to Jervis Bay.	Nil	No suitable habitat present within the Study Area. Species not recorded during the assessment.
28.	*Tetratheca juncea* Black-eyed Susan	V	V	18	BioNet Atlas, PMST	Grows in sandy, occasionally swampy heath and in dry sclerophyll forest; chiefly in coastal districts from Bulahdelah to Lake Macquarie.	Low	No suitable habitat for this species present within the Study Area. Low number of records within the locality.
29.	*Thesium austral* Austral Toadflax	V	V	0	PMST	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	Low	Potentially suitable habitat within grassland areas dominated by *Themeda australis*. No known records within the locality.
Birds								
1.	*Anseranas semipalmata* Magpie Goose	V	-	1	BioNet Atlas	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas; nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW.	Low	Potentially suitable habitat are in shallow water bodies within the Study Area; however, breeding is unlikely to occur within south-east NSW. One BioNet record from 1980 within the locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
2.	*Anthochaera phrygia* Regent Honeyeater	E	CE	3	BioNet Atlas, PMST	Mostly recorded in box-ironbark eucalypt associations. At times of food shortage, the species also uses other woodland types and wet lowland coastal forest dominated by *Eucalyptus robusta* (Swamp Mahogany) or *Corymbia maculata* (Spotted Gum).	Low-	Potential foraging habitat within wooded vegetation of the Study Area. Low number of records within the locality, not in proximity to the Study Area. Study Area is not mapped as important habitat for this species under the BAM important habitat mapping (DPE, 2022e).
3.	*Artamus cyanopterus cyanopterus* Dusky Woodswallow	V	-	4	BioNet Atlas	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	Low	Broadly suitable foraging habitat within the Study Area. Low number of BioNet records within the locality. No records within proximity to the Study Area.
4.	*Callocephalon fimbriatum* Gang-gang Cockatoo	V	E	2	BioNet Atlas	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. Gang-gang Cockatoos feed mainly on seeds of native and introduced trees and shrubs, with a preference for eucalypts, wattles and introduced hawthorns.	Low	Marginally suitable foraging habitat within wooded vegetation dominated by *Eucalyptus spp.* Most recent BioNet record within the locality is from 2004.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
5.	*Calyptorhynchus lathami* Glossy Black-Cockatoo	V	-	2	BioNet Atlas	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur. Black She-oak (*Allocasuarina littoralis*) and Forest She-oak (*A. torulosa*) are important foods. Potential nest trees contain hollows that are; (i) at least 8 m above the ground; and (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees, and may be near-vertical or vertical.	Low	No suitable foraging habitat within the Study Area. Low number of BioNet records within the locality.
6.	*Daphoenositta chrysoptera* Varied Sittella	V	-	8	BioNet Atlas	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Low - moderate	Potentially suitable foraging habitat within the Study Area. Low number of BioNet records within the locality. Two recent records within proximity to the Study Area.
7.	*Ephippiorhynchus asiaticus* Black-necked Stork	E	-	25	BioNet Atlas	Inhabits wetlands, such as floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water. Occasionally individuals will stray into open grass, woodland areas or flooded paddocks in search of food. Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat).	Low	Primarily unsuitable foraging habitat within the Study Area. No suitable breeding habitat within the Study Area. Most sightings are located within the vicinity of the Woodberry Swamp, to the south-east of the Study Area.
8.	*Erythrotriorchis radiatus* Red Goshawk	CE	V	0	PMST	Occurs in tropical and warm-temperate woodlands and forests. Mostly occurs in northern Australia with populations also occurring in the southeast of QLD and northeast of NSW.	Low	Broadly suitable foraging habitat within the Study Area. No known Records within locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
9.	*Falco hypoleucos* Grey Falcon	-	V	0	PMST	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Nil	No suitable habitat present within the Study Area. No known records within the locality.
10.	*Glossopsitta pusilla* Little Lorikeet	V	-	27	BioNet Atlas	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in *Angophora, Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m).	**Moderate**	Potentially suitable habitat within eucalypt dominated areas of the Study Area. Records within the locality including 2 records adjacent to the Study Area in wooded vegetation.
11.	*Haliaeetus leucogaster* White-bellied Sea-Eagle	V	M	14	BioNet Atlas	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest. This species hunts for fish, turtles and sea snakes however will feed on carrion along the waterline. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'.	Low	Primarily unsuitable foraging habitat within the Study Area. No suitable breeding habitat within the Study Area. This species may, on occasion, fly over the site.
12.	*Hamirostra melanosternon* Black-breasted Buzzard	V	-	1	BioNet Atlas	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands.	Low	No suitable breeding or foraging habitat within the Study Area. One BioNet record within the locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
13.	*Hieraaetus morphnoides* Little Eagle	V	-	2	BioNet Atlas	Occupies open eucalypt forest, woodland or open woodland. She-oak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Low	Potentially suitable habitat within the Study Area due to remnant eucalypt woodland. Only 2 BioNet records, with the most recent sighting in 2014, approx. 5kms from the Study Area.
14.	*Lathamus discolor* Swift Parrot	E	CE	2	BioNet Atlas, PMST	This migratory species has been recorded on the mainland from a variety of habitat types including dry and wet sclerophyll forest, forested wetlands, coastal swamp forests and heathlands. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Forest Red Gum (*E. tereticornis*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). The Study Area is not mapped within important areas for this species (DPIE, 2021b).	Low	Potentially suitable foraging habitat within the Study Area when *Eucalyptus spp.* and *Corymbia spp.* are in flower. This species does not breed on the Australina mainland. The Study Area is not mapped as important habitat under BAM important habitat mapping (DPE, 2022e).
15.	*Lophoictinia isura* Square-tailed Kite	V	-	1	BioNet	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	Low	Not particularly suitable habitat for foraging or breeding within the Study Area. Only one BioNet record from 1993 within the locality.
16.	*Melithreptus gularis gularis* Black-chinned Honeyeater (eastern subspecies)	V	-	3	BioNet Atlas	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. microcarpa* (Inland Grey Box), *E. melliodora* (Yellow Box), *E. blakelyi* (Blakely's Red Gum) and *E. tereticornis* (Forest Red Gum). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river she-oaks (nesting habitat) and tea-trees.	Low	Broadly suitable foraging habitat within the Study Area. Low number of records within locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
17.	*Neophema pulchella* Turquoise Parrot	V	-	2	BioNet Atlas	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants or browsing on vegetable matter. Nests in tree hollows, logs or posts, from August to December.	Low	Marginal foraging habitat present within Study Area around eucalypt woodland. Low number of BioNet records within the locality with the most recent being 2004
18.	*Ninox connivens* Barking Owl	V	-	2	BioNet Atlas	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. Potential nest trees are living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	Low	Potentially suitable foraging habitat within the Study Area. No suitable hollows for breeding within the Study Area. Low number of BioNet records.
19.	*Ninox strenua* Powerful Owl	V	-	20	BioNet Atlas	The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera* (Turpentine), *Allocasuarina littoralis* (Black She-oak), *Acacia melanoxylon* (Blackwood), *Angophora floribunda* (Rough-barked Apple), *Exocarpos cupressiformis* (Cherry Ballart) and a number of eucalypt species. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Low	Potentially suitable foraging habitat within the Study Area due to the fragmented vegetation across the site. No suitable hollows for breeding with the Study Area. Low-moderate number of records with a recent record (2019) within 1.2kms of the Study Area.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
20.	*Oxyura australis* Blue-billed Duck	V	-	2	BioNet Atlas	Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. Forages far from the shore, particularly if dense cover is available in the central parts of the wetland, on the bottom of swamps. Usually nest solitarily in Cumbungi over deep water.	Low	No water bodies within the Development Site. Water bodies within the Study Area do contain dense vegetation, however, they are shallow and not substantial enough in size for this species.
21.	*Pandion cristatus* Eastern Osprey	V	M	3	BioNet Atlas	This species favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Low	No suitable foraging or breeding habitat within the Study Area. Low number of BioNet records.
22.	*Petroica boodang* Scarlet Robin	V	-	1	BioNet Atlas	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber. Over Autumn and Winter often lives in open grassy woodlands, and grasslands or grazed paddocks with scattered trees.	Low	Broadly suitable within the Study Area. Only one BioNet record within the locality form 1995.
23.	*Pomatostomus temporalis temporalis* Grey-crowned Babbler (eastern subspecies)	V	-	33	BioNet Atlas	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. Forages on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses.	**Moderate**	Potentially suitable foraging habitat within the Study Area. Records within the locality, including some within proximity to the Study Area. No nests were identified during the assessment.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
24.	*Ptilinopus magnificus* (Wompoo Fruit-Dove)	V	-	1	BioNet	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Most often seen in mature forests, but also found in remnant and regenerating rainforest.	Low	Preferred habitat does not occur within the Study Area due to lack of rainforest and/or wet eucalypt forest. One recent BioNet record within the locality.
25.	*Stictonetta naevosa* Freckled Duck	V	-	5	BioNet	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Low	Marginally suitable habitat around waterbodies within the Study Area that contain *Typha spp.*. Low number of BioNet records within the locality, with the most recent being 1985.
26.	*Tyto novaehollandiae* Masked Owl	V	-	13	BioNet Atlas	Lives in dry eucalypt forest and woodlands from sea level to 1100m. Optimal habitat includes an open understory and a mosaic of sparse (grassy) and dense (shrubby) ground cover on gentle terrain. Masked Owls nest in large hollow eucalypts usually with an internal diameter of 35-50cm and 12-20m high and tend to be within 100m of a creek line (LMCC, 2014). Dead stags are especially popular for roosting/breeding habitat and are a limited resource due to natural attrition.	Low	Potential foraging habitat within the Study Area. No suitably sized hollows for breeding habitat within the Study Area. Recent BioNet records within 500m of the Study Area.
27.	*Tyto tenebricosa* Sooty Owl	V	-	1	BioNet	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. This species forages on arboreal mammals. Nest trees usually consist of large trees with hollows approximately 12m high and have an internal diameter of 35-50cm and tend to occur within 100m of creek lines (LMCC, 2014).	Low	Potential foraging habitat within the Study Area. No suitable breeding hollows within the Study Area. Only one record within the locality form 2002.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
Mammals								
1.	*Chalinolobus dwyeri* Large-eared Pied Bat	V	V	2	BioNet Atlas, PMST	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	Low	Unsuitable roosting habitat within the Study Area. Low number of BioNet records
2.	*Dasyurus maculatus* Spotted-tailed Quoll	V	E	1	BioNet Atlas, PMST	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Mostly nocturnal, although will hunt during the day; spend most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds.	Low	Marginally suitable foraging habitat within the Study Area. Marginal breeding habitat within wooded areas containing large hollows. One record from 2004 within the locality.
3.	*Falsistrellus tasmaniensis* Eastern False Pipistrelle	*V*	-	36	BioNet Atlas	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings.	Low	No suitable habitat within the Study Area. Species previously recorded in 2008 to the east of the Study Area. Low-moderate number of records within the locality.
4.	*Micronomus norfolkensis* Eastern Coastal Freetail-bat	*V*	-	50	BioNet Atlas	Tall open forest, Melaleuca, dry sclerophyll forest, River Red Gum and Yellow Box woodlands and riparian open forest. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	**Known**	Previously identified within the Study Area as part of the Flora and Fauna Assessment (Kleinfelder, 2017).

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
5.	*Miniopterus australis* Little Bent-winged Bat	*V*	-	116	BioNet Atlas	Occupies moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings.	**Known**	Previously recorded within the Study Area in 2017 (Kleinfelder, 2017). No suitable breeding habitat.
6.	*Miniopterus orianae oceanensis* Large Bent-winged Bat (recently renamed from *Miniopterus schreibersii oceanensis* Eastern Bentwing-bat)	*V*	-	39	BioNet Atlas	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	**Known**	Previously recorded within the Study Area in 2017 (Kleinfelder, 2017). No suitable breeding habitat.
7.	*Myotis macropus* Southern Myotis	*V*	-	39	BioNet Atlas	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	**Known**	Previously recorded within the Study Area during the Flora and Fauna Assessment for the 107 Haussman Drive (Kleinfelder, 2017). No suitable foraging habitat.
8.	*Petauroides Volans* Greater Glider	-	V	2	BioNet Atlas, PMST	Open woodland and tall remnant forests where there is suitable eucalypt trees. Rests in hollow trees during the day and feeds at night. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows.	Low	Marginal habitat suitability in remnant vegetation within the Study Area. Low number of records within the locality, most recent being 1998.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
9.	*Petaurus norfolcensis* Squirrel Glider	V	-	28	BioNet Atlas	Inhabits mature or old growth Box, Box-Ironbark woodlands and *Eucalyptus tereticornis* (River Red Gum) forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	**Moderate**	The Study Area may represent potential foraging and breeding habitat for this species. Records occur within the locality.
10.	*Petrogale penicillata* Brush-tailed Rock Wallaby	E	V	0	PMST	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging.	Nil	No suitable habitat present within the Study Area. No known records within the Study Area.
11.	*Phascogale tapoatafa* Brush-tailed Phascogale	*V*	-	5	BioNet Atlas	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span	**Moderate**	Potentially suitable foraging and breeding habitat within the Study Area. Low number of records within the locality. One recent (2018) record in proximity to the Study Area.
12.	*Phascolarctos cinereus* Koala	E	E	1	BioNet Atlas, PMST	Found in a variety of forest types with suitable feed tree species. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Low	Site contains low numbers Koala Feed Trees as listed under the Koala SEPP 2020 - *E. punctata*. Very few records within the locality.
13.	*Potorous tridactylus tridactylus* Long-nosed Potoroo (SE Mainland Population)	V	V	0	PMST	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Low	Potentially suitable habitat within the Study Area. No known records within the locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
14.	*Pseudomys novaehollandiae* New Holland Mouse	-	V	0	PMST	Inhabits open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Nil	No suitable habitat within the Study Area. No known records within the locality.
15.	*Pteropus poliocephalus* Grey-headed Flying-fox	V	V	64	BioNet Atlas, PMST	Occurs across a wide range of habitat types along the eastern seaboard of Australia, depending on food availability. Fruit from myrtaceous trees and rainforest trees form the major components of their diet.	**Moderate**	May forage within the Study Area of flowering *Eucaloyptus spp.* No Flying-fox camp within the Study Area. Closest known nationally significant camp occurs at Tenambit, East Maitland.
16.	*Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat	V	-	8	BioNet Atlas	Roosts in tree hollows and buildings. In treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees.	Low	Potential habitat within the Study Area. Low number of records within the locality.
17.	*Scoteanax rueppellii* Greater Broad-nosed Bat	V	-	26	BioNet Atlas	This species occurs in a variety of habitats including rainforest, dry and wet sclerophyll forest and eucalypt woodland.	**Moderate**	Potentially suitable habitat within the Study Area. Low-moderate amount of records within the locality, including some in proximity to the Study Area.
18.	*Vespadelus troughtoni* Eastern Cave Bat	V	-	15	BioNet Atlas	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	Low	No suitable roosting habitat within the Study Area. No records within proximity to the Study Area. No suitable breeding habitat.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
Amphibians								
1.	*Heleioporus australiacus* Giant Burrowing Frog	-	V	0	PMST	The species occurs along the coast and eastern slopes of the Great Dividing Range south from Wollemi National Park, appearing to exist as 2 populations between Jervis Bay and Eden. Habitat for the species includes sandy soils supporting heath, woodland or open forest. The species breeds in ephemeral to intermittent streams with persistent pools. Only infrequently moves to breeding sites, most commonly found on ridges away from creeks, several hundred metres from water.	Nil	No suitable habitat within the Study Area. No known records within the locality.
2.	*Litoria aurea* Green and Golden Bell Frog	E	V	1	BioNet Atlas, PMST	This species prefers open water bodies, fringed by reeds and other aquatic vegetation for breeding and foraging purposes. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Needs fallen logs and debris for shelter and over-wintering purposes.	Low	No water bodies are present within the Development Site. Water bodies within the Study Area, but outside of the Development Site contain dense *Typha orientalis* vegetation with no open water space. One BioNet record within the locality. Sighting is from 1976.
3.	*Mixophyes balbus* Stuttering Frog	-	V	0	PMST	The species occurs along the east coast of Australia. Habitat for the species includes rainforest and wet, tall, open forest, sheltering in deep leaf litter and thick understorey vegetation on the forest floor. Within Sydney Basin the species is now confined to populations in the Watagan Mountains, the southern Blue Mountains and Macquarie Pass. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts.	Nil	No suitable habitat within the Study Area. No known records within the locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
4.	*Mixophyes iteratus* Giant Barred Frog	-	E	0	PMST	Occurs on the coast and ranges from south-eastern QLD to the Hawkesbury River in NSW, particularly in Coffs Harbour - Dorrigo area. Forage and live amongst deep, damp leaf litter in rainforest, moist eucalypt forest and nearby dry eucalypt forest. Breed in shallow, flowing rocky streams. Within Sydney Basin, confined to small populations in tall, wet forest in the Watagan Mountains north of the Hawkesbury and the lower Blue Mountains.	Nil	No suitable habitat within the Study Area. No known records within the locality.
5.	*Uperoleia mahonyi* Mahonyi's Toadlet	E	E	0	PMST	Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland.	Nil	No suitable habitat within the Study Area. No known records within the locality.
Migratory Terrestrial Species								
1.	*Calidris acuminata* Sharp-tailed Sandpiper	-	M	7	BioNet Atlas, PMST	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. Also occur in saltworks and sewage farms. Use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. Use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
2.	*Calidris melanotos* Pectoral Sandpiper	-	M	2	BioNet Atlas, PMST	Prefers shallow fresh to saline wetlands. Found in coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. Has also been recorded in swamp overgrown with lignum. Forage in shallow water or soft mud at the edge of wetlands.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.
	Calidris ruficollis Red-necked Stint	-	M	1	BioNet Atlas	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. Sometimes use flooded paddocks or damp grasslands.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.
	Chlidonias leucopterus White-winged Black Tern	-	M	1	BioNet Atlas	Non-breeding visitor, inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. Frequents tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers, floodplains, reservoirs, saltworks, sewage ponds and outfalls are also inhabited.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.
	Cuculus optatus Oriental Cuckoo	-	M	0	PMST	Occurs at rainforest edges, leafy trees in paddocks, river flats, roadsides and mangroves.	Nil	No suitable habitat present onsite. No known records of this species within locality.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
	Gallinago hardwickii Latham's Snipe	-	M	5	BioNet Atlas, PMST	Often recorded in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.
	Gelochelidon nilotica Gull-billed Tern	-	M	2	BioNet Atlas	Found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.
	Hirundapus caudacutus White-throated Needletail	-	M	3	BioNet Atlas, PMST	Forages in high open spaces over varied habitat types although probably recorded most often above wooded or partly wooded areas, including open forest and rainforest, and may also fly between trees or in clearings.	Low	This species may utilise areas above wooded vegetation for foraging within the Study Area. Low number of BioNet records within the locality.
	Monarcha melanopsis Black-faced Monarch	-	M	0	PMST	Found in rainforests, moist eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Nil	Habitat not suitable for species within the Study Area
	Monarcha trivirgatus Spectacled Monarch	-	M	0	PMST	Inhabits the understorey of mountain/ lowland rainforests, thickly wooded gullies and waterside vegetation including mangroves.	Nil	
	Motacilla flava Yellow Wagtail	-	M	0	PMST	Found in a variety of habitats including short grass and bare ground, swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and town lawns.	Low	Marginally suitable habitat present within the Study Area. No known records within the Study Area.
	Myiagra cyanoleuca Satin Flycatcher	-	M	0	PMST	Found in tall forests, preferring wetter habitats such as heavily forested gullies.	Nil	No suitable habitat present within the Study Area. No known records within the Study Area.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
	Rhipidura rufifrons Rufous Fantail	-	M	0	PMST	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Nil	No suitable habitat present within the Study Area. No known records within the Study Area.
	Thalasseus bergii Crested Tern	-	M	1	BioNet Atlas	The Crested Tern is usually a strictly coastal species. They breed in colonies on small offshore islands	Low	No suitable habitat present within the Study Area. One BioNet record within the locality from 1986.
	Tringa glareola Wood Sandpiper	-	M	3	BioNet Atlas	Occupies well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. Typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially *Melaleuca* and *Eucalyptus camaldulensis* (River Red Gums) and often with fallen timber. Also frequents inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. This species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains.	Low	Marginal habitat may be present around artificial waterbodies within the Study Area. Low number of BioNet records.
	Tringa nebularia Common Greenshank	-	M	4	BioNet Atlas, PMST	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. Uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
	Tringa stagnatilis Marsh Sandpiper	-	M	2	BioNet Atlas	Lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	Low	No suitable habitat present within the Study Area. Low number of BioNet records.
Threatened Ecological Communities								
1.	*Central Hunter Valley Eucalypt Forest and Woodland*	-	CE	-	PMST	Not present within the Study Area.	Absent	Vegetation on site is not consistent with Threatened Ecological Community.
2.	*Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South Eastern Queensland ecological community*	-	E	-	PMST	Not present within the Study Area.	Absent	Vegetation on site is not consistent with Threatened Ecological Community.
3.	*Lowland Rainforest of Subtropical Australia*	-	CE	-	PMST	Not present within the Study Area.	Absent	Vegetation on site is not consistent with Threatened Ecological Community.
4.	*River-flat Eucalypt Forest on Coastal Floodplains of Southern New South Wales and Eastern Victoria*	-	CE	-	PMST	Not present within the Study Area.	Absent	Vegetation on site is not consistent with Threatened Ecological Community.

	Species	Status*		Records**	Source***	Habitat	LoO	Summary
		BC	EPBC					
5.	*Subtropical and Temperate Saltmarsh*	-	V	-	PMST	Not present within the Study Area.	Absent	Vegetation on site is not consistent with Threatened Ecological Community.
6.	*White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*	-	CE	-	PMST	Not present within the Study Area.	Absent	Vegetation on site is not consistent with Threatened Ecological Community.
7.	*Lower Hunter Spotted Gum Ironbark Forest*	E	-	-	-	Vegetation present on site is commensurate with the endangered ecological community	**Present**	**Known**

* Status. *Biodiversity Conservation Act 2016* (BC), *Environment Protection and Biodiversity Conservation Act* (EPBC), M (Migratory), V (Vulnerable), E (Endangered), CE (Critically Endangered), E3 (Endangered Ecological Community), E4B (Critically Endangered Ecological Community)

** Records. # (number of records within locality), P (Predicted), K (known to occur with the locality).

*** Source. Bionet (NSW Department of Planning, Industry and Environment (DPIE) BioNet Atlas), PMST (Protected matter database search tool).

APPENDIX B FLORA SPECIES LIST

Table B1 Flora Species List

No.	Scientific Name	Common Name	BAM Growth Form*	Status
1.	*Acacia elongata*	Swamp Wattle	Shrub (SG)	-
2.	*Acacia falcata*		Shrub (SG)	-
3.	*Acacia fimbriata*	Fringed Wattle	Shrub (SG)	-
4.	*Acacia irrorata*	Green Wattle	Shrub (SG)	-
5.	*Acacia parvipinnula*	Silver-stemmed Wattle	Shrub (SG)	-
6.	*Acacia spp.*	Wattle	Shrub (SG)	-
7.	*Ambrosia tenuifolia*	Lacy Ragweed	Exotic	-
8.	*Amyema spp.*	Mistletoe	Other (OG)	-
9.	*Andropogon virginicus*	Whisky Grass	HTW	-
10.	*Angophora costata*	Sydney Red Gum	Tree (TG)	-
11.	*Aristida vagans*	Threeawn Speargrass	Grass & grasslike (GG)	-
12.	*Arthropodium milleflorum*	Pale Vanilla-lily	Forb (FG)	-
13.	*Asparagus aethiopicus*	Asparagus Fern	HTW	-
14.	*Aster subulatus*	Wild Aster	Exotic	-
15.	*Bidens pilosa*	Cobbler's Pegs	HTW	-
16.	*Billardiera scandens*	Hairy Apple Berry	Other (OG)	-
17.	*Brachyscome multifida*	Cut-leaved Daisy	Forb (FG)	-
18.	*Breynia oblongifolia*	Coffee Bush	Shrub (SG)	-
19.	*Bursaria spinosa*	Native Blackthorn	Shrub (SG)	-
20.	*Callistemon salignus*	Willow Bottlebrush	Shrub (SG)	-
21.	*Casuarina glauca*	Swamp Oak	Tree (TG)	-
22.	*Centella asiatica*	Indian Pennywort	Forb (FG)	-
23.	*Centella cordifolia*		Forb (FG)	-
24.	*Cheilanthes sieberi*	Rock Fern	Fern (EG)	-
25.	*Chloris gayana*	Rhodes Grass	HTW	-
26.	*Cirsium vulgare*	Spear Thistle	Exotic	-
27.	*Commelina cyanea*	Native Wandering Jew	Forb (FG)	-
28.	*Conyza bonariensis*	Flaxleaf Fleabane	Exotic	-
29.	*Cortaderia selloana*	Pampas Grass	HTW - Manageable	-
30.	*Corymbia maculata*	Spotted Gum	Tree (TG)	-
31.	*Cyanthillium cinereum*	Purple Fleabane	Exotic	-

No.	Scientific Name	Common Name	BAM Growth Form*	Status
32.	*Cymbopogon refractus*	Barbed Wire Grass	Grass & grasslike (GG)	-
33.	*Cynodon dactylon*	Common Couch	Grass & grasslike (GG)	-
34.	*Cyperus eragrostis*	Umbrella Sedge	HTW	-
35.	*Cyperus spp.*		Grass & grasslike (GG)	-
36.	*Daviesia ulicifolia*	Gorse Bitter Pea	Shrub (SG)	-
37.	*Desmodium rhytidophyllum*		Forb (FG)	-
38.	*Desmodium varians*	Slender Tick-trefoil	Other (OG)	-
39.	*Dianella caerulea*	Blue Flax-lily	Forb (FG)	-
40.	*Dichelachne micrantha*	Shorthair Plumegrass	Grass & grasslike (GG)	-
41.	*Dichondra repens*	Kidney Weed	Forb (FG)	-
42.	*Digitaria parviflora*	Small-flowered Finger Grass	Grass & grasslike (GG)	-
43.	*Dillwynia retorta*		Shrub (SG)	-
44.	*Echinochloa colona*	Awnless Barnyard Grass	Grass & grasslike (GG)	-
45.	*Echinopogon caespitosus*	Bushy Hedgehog-grass	Grass & grasslike (GG)	-
46.	*Einadia nutans*	Climbing Saltbush	Forb (FG)	-
47.	*Entolasia stricta*	Wiry Panic	Grass & grasslike (GG)	-
48.	*Eragrostis brownii*	Brown's Lovegrass	Grass & grasslike (GG)	-
49.	*Eucalyptus fibrosa*	Red Ironbark	Tree (TG)	-
50.	*Eucalyptus globoidea*	White Stringybark	Tree (TG)	-
51.	*Eucalyptus moluccana*	Grey Box	Tree (TG)	-
52.	*Eucalyptus punctata*	Grey Gum	Tree (TG)	-
53.	*Eucalyptus paniculata*	Grey Ironbark	Tree (TG)	-
54.	*Eucalyptus spp.*		Tree (TG)	-
55.	*Eucalyptus umbra*	Broad-leaved White Mahogany	Tree (TG)	-
56.	*Exotic Palm seedling*		Exotic	-
57.	*Facelis retusa*		Exotic	-
58.	*Fimbristylis dichotoma*	Common Fringe-sedge	Grass & grasslike (GG)	-
59.	*Gamochaeta spp.*		Exotic	-
60.	*Geitonoplesium cymosum*	Scrambling Lily	Other (OG)	-
61.	*Glycine clandestina*	Twining glycine	Other (OG)	-
62.	*Glycine microphylla*	Small-leaf Glycine	Other (OG)	-
63.	*Glycine tabacina*	Variable Glycine	Other (OG)	-

No.	Scientific Name	Common Name	BAM Growth Form*	Status
64.	*Gonocarpus tetragynus*	Poverty Raspwort	Forb (FG)	-
65.	*Gonocarpus teucrioides*	Germander Raspwort	Forb (FG)	-
66.	*Goodenia paniculata*		Forb (FG)	-
67.	*Goodenia rotundifolia*		Forb (FG)	-
68.	*Hardenbergia violacea*	False Sarsaparilla	Other (OG)	-
69.	*Hydrocotyle laxiflora*	Stinking Pennywort	Forb (FG)	-
70.	*Hypericum gramineum*	Small St John's Wort	Forb (FG)	-
71.	*Hypochaeris radicata*	Catsear	Exotic	-
72.	*Imperata cylindrica*	Blady Grass	Grass & grasslike (GG)	-
73.	*Indigofera australis*	Australian Indigo	Shrub (SG)	-
74.	*Juncus usitatus*		Grass & grasslike (GG)	-
75.	*Lagenophora stipitata*	Common Lagenophora	Forb (FG)	-
76.	*Lantana camara*	Lantana	HTW - Manageable	-
77.	*Lepidosperma laterale*	Variable Sword-sedge	Grass & grasslike (GG)	-
78.	*Leucopogon juniperinus*	Prickly Beard-heath	Shrub (SG)	-
79.	*Lobelia purpurascens*	Whiteroot	Forb (FG)	-
80.	*Lomandra confertifolia*	Matrush	Grass & grasslike (GG)	-
81.	*Lomandra filiformis*	Wattle Matt-rush	Grass & grasslike (GG)	-
82.	*Lomandra glauca*	Pale Mat-rush	Grass & grasslike (GG)	-
83.	*Lomandra longifolia*	Spiny-headed Mat-rush	Grass & grasslike (GG)	-
84.	*Megathyrsus maximus*		Exotic	-
85.	*Melaleuca armillaris subsp. armillaris*	Bracelet Honey-myrtle	Shrub (SG)	-
86.	*Microlaena stipoides*	Weeping Grass	Grass & grasslike (GG)	-
87.	*Notelaea longifolia*	Large Mock-olive	Tree (TG)	-
88.	*Opercularia diphylla*	Stinkweed	Forb (FG)	-
89.	*Oxalis perennans*		Forb (FG)	-
90.	*Ozothamnus diosmifolius*	White Dogwood	Shrub (SG)	-
91.	*Panicum simile*	Two-colour Panic	Grass & grasslike (GG)	-
92.	*Parsonsia straminea*	Common Silkpod	Other (OG)	-
93.	*Paspalidium distans*		Grass & grasslike (GG)	-
94.	*Paspalum dilatatum*	Paspalum	HTW	-
95.	*Philydrum lanuginosum*	Frogsmouth	Forb (FG)	-

No.	Scientific Name	Common Name	BAM Growth Form*	Status
96.	*Phytolacca octandra*	Inkweed	Exotic	-
97.	*Plantago lanceolata*	Lamb's Tongues	Exotic	-
98.	*Plectranthus parviflorus*		Forb (FG)	-
99.	*Pseuderanthemum variabile*	Pastel Flower	Forb (FG)	-
100.	*Pterostylis spp.*	Greenhood	Forb (FG)	-
101.	*Pultenaea paleacea*	Chaffy Bush-pea	Shrub (SG)	-
102.	*Pultenaea retusa*		Shrub (SG)	-
103.	*Pultenaea spinosa*		Shrub (SG)	-
104.	*Pultenaea villosa*	Hairy Bush-pea	Shrub (SG)	-
105.	*Rytidosperma caespitosum*	Ringed Wallaby Grass	Grass & grasslike (GG)	-
106.	*Schoenus apogon*	Fluke Bogrush	Grass & grasslike (GG)	-
107.	*Senecio madagascariensis*	Fireweed	HTW	-
108.	*Senna pendula var. glabrata*		HTW - Manageable	-
109.	*Setaria parviflora*		Exotic	-
110.	*Setaria sphacelata*	South African Pigeon Grass	Exotic	-
111.	*Sida rhombifolia*	Paddy's Lucerne	Exotic	-
112.	*Solanum mauritianum*	Wild Tobacco Bush	Exotic	-
113.	*Solanum nigrum*	Black-berry Nightshade	Exotic	-
114.	*Solanum prinophyllum*	Forest Nightshade	Forb (FG)	-
115.	*Sonchus asper*	Prickly Sowthistle	Exotic	-
116.	*Sphaeromorphaea australis*	Spreading Nut-heads	Forb (FG)	-
117.	*Themeda triandra*	Kangaroo Grass	Grass & grasslike (GG)	-
118.	*Triadica sebifera*	Chinese Tallowood	HTW - Manageable	-
119.	*Tricoryne elatior*	Yellow Autumn-lily	Forb (FG)	-
120.	*Typha orientalis*	Broad-leaved Cumbungi	Grass & grasslike (GG)	-
121.	*Verbena bonariensis*	Purpletop	Exotic	-
122.	*Wahlenbergia gracilis*	Sprawling Bluebell	Forb (FG)	-

APPENDIX C FAUNA SPECIES LIST

Table C1 Fauna Species List

No.	Scientific Name	Common Name	Status		Observation Type*	General Abundance within Development Site**
			BC Act	EPBC Act		
	Birds					
1.	*Acridotheres tristis*	Common Myna	-	-	VO	C
2.	*Cacatua sanguinea*	Little Corella	-	-	VO, H	UC
3.	*Corvus coronoides*	Australian Raven	-	-	H	C
4.	*Cracticus tibicen*	Australian Magpie	-	-	VO, H	C
5.	*Eolophus roseicapillus*	Galah	-	-	VO	UC
6.	*Trichoglossus haematodus*	Rainbow Lorikeet	-	-	VO	C

* Observation Type: VO (Visual Observation), H (Heard whilst on site), E (Evidence recorded inc scats, tracks or markings), C (Caught on Remote Camera), T (Trapped), R (Recorded through the use of call detectors).

** General Abundance: I (Individual record), UC (Uncommon, 2-5 records), C (Common occurrence on site >5 records). Anabat Detections are classed by confidence: Confident (C), Probable (Pr), and Possible (Po)

^ Denotes introduced species.

APPENDIX D PREDICTED AND CANDIDATE SPECIES REPOORTS

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024274/BAAS18041/21/00025808	107 Haussman Drive	16/06/2022
Assessor Name	Report Created	BAM Data version *
Gilbert Whyte	11/08/2022	54
Assessor Number	Assessment Type	BAM Case Status
BAAS18041	Part 4 Developments (Small Area)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
0	BOS Threshold: Area clearing threshold	11/08/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Diamond Firetail	Stagonopleura guttata	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Gang-gang Cockatoo	Callocephalon fimbriatum	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Glossy Black-Cockatoo	Calyptorhynchus lathami	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Greater Broad-nosed Bat	Scoteanax rueppellii	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter

Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Grey-headed Flying-fox	Pteropus poliocephalus	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Large Bent-winged Bat	Miniopterus orianae oceanensis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Little Bent-winged Bat	Miniopterus australis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Little Eagle	Hieraaetus morphnoides	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Little Lorikeet	Glossopsitta pusilla	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Masked Owl	Tyto novaehollandiae	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Painted Honeyeater	Grantiella picta	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Powerful Owl	Ninox strenua	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Regent Honeyeater	Anthochaera phrygia	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Scarlet Robin	Petroica boodang	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Speckled Warbler	Chthonicola sagittata	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Spotted-tailed Quoll	Dasyurus maculatus	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Square-tailed Kite	Lophoictinia isura	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Swift Parrot	Lathamus discolor	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Turquoise Parrot	Neophema pulchella	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Varied Sittella	Daphoenositta chrysoptera	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
White-bellied Sea-Eagle	Haliaeetus leucogaster	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter

White-throated Needletail	Hirundapus caudacutus	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Yellow-bellied Glider	Petaurus australis	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Candidate Species Report

Proposal Details

Assessment Id 00024274/BAAS18041/21/00025808	Proposal Name 107 Haussman Drive	BAM data last updated * 16/06/2022
Assessor Name Gilbert Whyte	Report Created 11/08/2022	BAM Data version * 54
Assessor Number BAAS18041	Assessment Type Part 4 Developments (Small Area)	BAM Case Status Finalised
Assessment Revision 0	Date Finalised 11/08/2022	BOS entry trigger BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
North Rothbury Persoonia	Persoonia pauciflora	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

APPENDIX E BIODIVERSITY CREDIT REPORTS

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00024274/BAAS18041/21/00025808

Proposal Name
107 Haussman Drive

BAM data last updated *
16/06/2022

Assessor Name
Gilbert Whyte

Assessor Number
BAAS18041

BAM Data version *
54

Proponent Names
Sam Rowe

Report Created
11/08/2022

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
11/08/2022

BOS entry trigger
BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	0.8	9	11	20

BAM Biodiversity Credit Report (Like for like)

1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1592_Modified	Yes	9	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1592_Remnant	No	11	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00024274/BAAS18041/21/00025808

Proposal Name
107 Haussman Drive

BAM data last updated *
16/06/2022

Assessor Name
Gilbert Whyte

Assessor Number
BAAS18041

BAM Data version *
54

Proponent Name(s)
Sam Rowe

Report Created
11/08/2022

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
11/08/2022

BOS entry trigger
BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

BAM Biodiversity Credit Report (Variations)

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	0.8	9	11	20.00

1592-Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1592_Modified	Yes	9	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602	-	1592_Remnant	No	11	Hunter,Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 3 or higher threat status	1592_Modified	Yes (including artificial)	9	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 3 or higher threat status	1592_Remnant	No	11	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

APPENDIX F STAFF CONTRIBUTIONS

The following staff were involved in the compilation of this report.

Table E1 Staff Contributions

Name	Qualification	Title/Experience	Contribution
Ben Stewart	MMarSc&Mgt	Ecologist (Botanist)	Field surveys and report writing
Dr. Daniel O'Brien	B EnvMgtSc&Sc (PhD)	Senior Ecologist	Report writing and report review
Dr. Gilbert Whyte	B Sc (PhD) Accredited BAM Assessor	Senior Ecologist	Flora Surveys and report review
James Baldry	MConsBio	Graduate Ecologist	Field surveys
Gayle Joyce	B Sc (Forestry) (Hons)	GIS Specialist	GIS and figure preparation
Alan McDonaugh		GIS Specialist	GIS and figure preparation

APPENDIX G LICENCING

Kleinfelder employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL100730, Expiry: 31 March 2023) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.

APPENDIX H BAM PLOT DATA

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR.	PLOT ID: Q01	RECORDER: B. STEWART.

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Stratum 1 Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)					
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
						BURSARIA SP.	0.5	10	MIC. STIP.	10	200	CHEILANTHES S.	0.1	20	SOLANUM N.	0.1	2
						PULTEN. VIL.	1	20	THEM. TRI.	65	1000	HARDEN. VIO.	0.1	5	SENECIO MAD.	0.5	50
						EUC. UMBRA/SPARS.	1	10	PASPALIDIUM D. ?✓	0.2	10	LOMANDRA FIL.	0.1	2	BIDENS PIL.	0.1	20
						INDIGOFERA A.	0.1	1	ENTOLASIA S.	1	50	LOB. PURP.	0.1	50	PASPALUM D.	5	40
						ACACIA ~~ELONG.~~	1	30	DICHELACHNE M. ~~LACHNAGROSTIS~~	5	150	GONO. TETRA.	0.2	50	VERB. BON.	0.2	5
						OZOTHAM. DIO.	0.2	5	IMP. CYLIN.	2	100	CENTELLA A.	0.2	100	CONYZA B.	0.5	50
						EUC. SPP.	0.2	2	ERAG. BROWNII	0.5	50	WAHLENBERGIA G.	0.1	5	HYPOCHAERIS R.	0.1	20
						BREYNIA OB.	0.1	2				DICH. REP.	0.1	50	SETARIA P.	0.1	5
												GOOD. PANIC.	0.2	70	CYANTHILLIUM. C.	0.1	10
												FIMBRIS. DICH.	0.1	1			
												LAGENOPH STIP.	0.1	20			
												GOODENIA R.	0.1	5			
												GLYCINE CLAN.	0.1	5			
												DIANELLA C.	0.1	1			
												PTEROSTYLIS SP.	0.1	1			

C (%): 0.1, 0.2, 0.3, …, 1, 2, 3, …, 10, 15, 20, 25, 30, … (to nearest 5%), 100. Include overhanging plants.
Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as 1

Note: *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m
400 m² PLOT

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR.	PLOT ID: Q02	RECORDER: B. STEWART.

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Overstorey Species			Understorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
						BURSARIA SP.	1	30	ENTO. STRIC.	15	500	LOMANDRA LONG.	1	20	ANDRO. VIRG.	35	500
						DILLWYNIA R.	0.2	15	ECHINO. CAES.	0.5	30	LOBELIA PURP.	0.1	50	LANTANA CAM.	0.2	2
						ACACIA ~~FALCIGATA~~	1	25	CYNODON DAC.	10	500	LEPIDOSP. LAT.	0.1	10	SENECIO MAD.	0.1	5
						EUC SP. / C. MAC	1	5	PANICUM ~~SP~~ SIM.	0.2	5	SPHAERO. AUSTRALIS SPREADING ASTER	1	100	PASP. DIL.	0.2	10
						PULT. SPIN.	0.2	10	RYTIDOSPERM. CAES. SP.	0.1	10	FIMB. DICH.	0.2	20	BIDENS PIL.	0.1	2
						DAV. ~~ULICIFOLIA~~	0.1	2	ARISTIDA V.	0.1	20	CENTELLA A.	0.1	40	HYPOCH. RAD.	0.1	2
						OZOTH. DIOS-	0.1	2	ERAG. BR.	0.5	50	GONO. TETRA.	0.2	50			
						PULT. VIL.	0.2	10	THEM. TRIA	0.2	5	JUNCUS U.	0.1	5			
						ACACIA ~~PARVIPINN.~~	0.1	2				SCHOENUS ~~APOGON~~	0.1	50			
						LEUCOPOGON J.	0.1	2				GOODENIA R.	0.1	5			
						PULT. ~~RETUSA~~	0.1	2				HARDENBG. V.	0.1	2			
												GLY. CLAN.	0.1	10			
												HYDROC. LAX.	0.1	50			

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100. Include overhanging plants.
Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as 1

Note: *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m
400 m² PLOT

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR	PLOT ID: Q03	RECORDER: B - STEWART

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Eucalypt Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Forbs		
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
EUC - GLOB? ~~BAMBRA~~ ?	5	5	ACACIA ~~FIMBRIATA~~ #?	5	10	BREYNIA OB.	0.2	5	PANICUM SIM.	2	~~30~~	GLYCINE TAB.	0.2	20	PASP. DIL.	5	50
EUC. SID.	2	3	ACACIA ~~ELONGATA~~	0.5	5	BURSARIA SPIN.	0.2	5	PASPALIDIUM D.	0.1	10	HARDERBERGIA	0.5	50	CHLORIS GA.	5	50
EUC. PUNC.	5	1	MEL. ARM.?	0.5	2	OZOTHAM. DIO.	0.1	10	ENTO. STRIC.	~~37~~	100	LOBELIA P.	0.2	50	SETARIA P.	0.5	10
									MICRO. STIP.	15	500	CENTELLA A.	0.1	50	SOLANUM A.	0.1	5
									CYNODON DAC.	0.5	20	CHEILANTH. SIEB.	0.1	20	LANTANA.	0.1	2
									EVTIDOSP. ~~COES. TAL.~~	0.2	10	OXALIS ~~LER.~~	0.1	20	VERB. BON.	0.1	5
									THEMEDA TR.	15	500	GLY. CLAN.	0.5	50	HYPOCH. RADI.	0.1	5
									ARISTIDA VAR.	2	100	LOMANDRA LONG	0.1	5	SETARIA SPH.	0.2	5
												DESMOD. VARI.	~~25~~ 1	150	SIDA RHOM.	1	70
												LOMANDRA CON.	0.2	10	SONCHUS ASP.	0.1	2
												DICHONDRA R.	0.1	50	CYANTHIL. CIN.	0.1	5
												OPERCULARIA.	0.1	10	BIDENS PIL.	0.1	5
												&			SENECIO MAD.	0.2	30
															CLAMOCHAETA	0.1	5
															AMBROSIA TEN.	0.5	50
															FACELIS RETUSA	0.1	5

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100. Include overhanging plants. **Note:** *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m

Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as 1

400 m² PLOT

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR.	PLOT ID: Q04	RECORDER: B. STEWART.

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Eucalypt Species			Understorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Weeds		
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
EUC. SID.	5	1				BURSARIA SP.N.	0.5	5	ENTO. STRICT.	~~10~~ 20	200	LOBELIA PURP.	~~1~~ 0.25	~~50~~ 100	HYPOCHAERIS	0.1	5
C. MACULATA.	20	2				ACACIA. ~~ELONG.~~ sp.	0.2	5	DIGITARIA P.	~~1~~ 2	35	HARDENBERGIA	0.5	50	LANTANA.	0.1	5
E. GLOB?	15	6				INDIGOFERA.	0.1	2	MICRO. STIP.	~~1~~ 2	30	ATHROLODIUM M.	0.1	1	PASPALUM DIL.	0.2	10
E. FIB.	3	1				ACACIA FAL.	0.1	1	ARISTIDA V.	05	25	CHEILANTHES S.	0.2	50	SENNA GLAB.	0.1	1
E. MOL.	2	1				DAV. ~~ACIC.~~ ULI.	0.1	3	ECHINOPOGON C.	0.1	5	~~BR~~ PSEUDERANTH.	0.2	50			
						OZOTH. DIO.	0.1	5	~~LACHNOSTACHYS~~ DICHELACH. M.O	0.1	5	LOMANDRA C.	0.1	5			
						ACACIA ~~SUAV.~~ FIMBRIATA	0.1	5	THEMEDA TR.	~~2~~ 1	50	DICHONDRA R.	0.1	40			
						PULT. VIL	0.1	2.	RYTIDOSP. ~~TAL.~~ CAES.	~~2~~ 1	60	DESMODIUM V.	0.1	10			
						PULT. ~~SUCH.~~ RETUSA.	0.1	1	PANICUM SIM.	0.2	15	COMMELINA.	0.1	5			
									CYMBO. R.	0.1	1	GLYCINE TAB.	0.1	10			
												PLECTRANTHUS P.	0.1	4			
												OPERCULARIA D.	0.1	5			
												SOLANUM PRIN.	0.1	2			
												LOMANDRA FIL.	~~1~~ 0.25	~~40~~ 100			
												BRACHYSCOME ~~MULT.~~	0.1	2			
												GOODENIA R.	0.1	10			
												DIANELLA CA.	0.1	10			
												MISTLETOE.	0.1	2			

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100. Include overhanging plants.
Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as 1

Note: *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m
400 m² PLOT

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR	PLOT ID: Q05	RECORDER: B. STEWART.

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Eucalypt Species			Shrubs by Species			Ground Cover (Grasses)			Ground Cover (Grasses)			Ground Cover (Other)					
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
C. MACULATA.	10	12				BURSARIA SPIN.	0.1	5	THEMEDA.	~~20~~	~~500~~	AMPHOR SPP. MISTLETOE.	0.1	1	PASPALUM D.	1	30
E. UMBRA ✓	5	3				A. FALC.	0.1	1	ENTO. STRIC.	5.	70	FIMBR. DICH.	2	100	CYPERUS ER.	0.5	20
E. PUNC.	3	0				ACACIA ~~SP.~~ CLOUD	0.1	2	MICR. STIP.	10	150	GONO. TENU.	0.5	70	SETARIA P.	0.1	10
E. MOL.	5	2							ARISTIDA V.	~~2~~	~~100~~	LAGENOPH STR.	0.1	20	BIDENS P.	0.1	5
									PANICUM SIM.	~~5~~	10	LOB.. PURP.	0.2	50	CYANTH. GIN.	0.1	5
									ERAG. BROWNII	0.1	10	GOOD. R.	0.1	5	~~ASTERACEAE ??~~	0.1	1
									DIGI. PARV.	~~0.5~~	40	LOMANDRA FIL	0.1	5	VERB. BON.	0.1	5
									~~DICHEL. MICR. LACHNOPHYLLUS~~	0.1	10	GLY. TAB.	0.1	5	CYPERUS SP.	0.1	10
									RYTIDO. ~~TAL.~~ LAES.	0.1	10	DIAN. CEN.	0.1	2	SIDA RHOM.	0.1	5
									IMP. CYLIN.	0.5	50	TRICHORYN HYPOX	0.1	3	SENECIO.	0.1	5
									CYNODON. D.	0.1	10	PSEUDERANTHEMUM	0.1	10	HYPO CHAERIS	0.1	5
									ECHINO. COLONA.	0.1	2	OPERC. D.	0.1	5	~~POA SP.~~	0.1	2
												HARDENBERGIA.	0.1	2	CONYZA BON	0.1	5
												SPHAERO. AUSTRALIS	0.1	10	SENNA GLAB.	0.1	2
												HYDRO LAX.	0.2	50	SOL. NIG.	0.1	1
												JUNCUS V.	0.2	20	FICUS R.	0.1	2
												CENTELLA A.	0.2	40			
												DICHONDRA R.	0.2	50			
												SOLANUM P.	0.1	2			
												WAHLENBERGIA.	0.1	1			
												ARTHROPODIUM	0.1	10			

C (%): 0.1, 0.2, 0.3, ..., **1**, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100. Include overhanging plants. **Note:** *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m

Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as **1**

400 m² PLOT

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR	PLOT ID: Q06	RECORDER: B. STEWART-

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Overstorey Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
						ACACIA. GONG SP.	0.2	10	ARISTIDA V.	1.	50	CHEILANTHES.	0.1	10	CORTADERIA SP.	0.5	1
						BURSARIA SP.	0.5	20	MICRO. STR.	10	500	LAGENOPHORA.	0.1	20	LANTANA	0.2	10
						OZOTH. DIO.	0.5	20	ERAG. BR.	0.5	20	FIMB. DICH.	75	100	SENECIO MAD.	05	40
						DILL. RETORT.	0.2	10	THEMEDA.	0.5	20	SPHAERO. AUSTRALIS SPREADING ASTE	0.5	100	ANDRO. VIRG.	10	70
						ACACIA TAL.	0.1	2	ENTO. STR.	20	500	GLY. CLAN.	0.1	10	ASTER SUB.	0.1	1
						PULT. VIL	0.3	10	PANICUM SIM	5	100	CENTELLA.	0.2	50	SIDA RHOM.	0.2	10
						PULT. SPIN.	0.5	10	DIGI. PARV.	37	70	LOM-LONG.	05	20	BIDENS PIL.	0.1	5
						EUC. SP.	0.5	2	ECHINO. CAE.	0.5	30	LOB. PURP	0.5	500	CONYZA B.	0.1	5
						DAV. ACIC.	0.1	5	DICH-MICRAN. LACHNOPHLOSTIC	37	150	CENTELLA COR.	0.1	30	HYPO. RADI.	0.1	5
						PULT. RETUSA	0.1	5	IMP. CYLIN.	5	100	HARDENBERGIA	0.2	5	PASP. DIL.	2	50
						CALLIST. SAL.	0.1	1				JUNCUS J.	1	50	VERB. BON.	0.2	5
												HYDRO. RAX	0.2	50	GAMOCHAETA.	0.1	5
												GLY. MICRO.	0.1	5	CHINESE TALLOW	0.1	1
												GOOD. PAN.	05	50			
												GOOD. R.	0.1	2			
												PARSON. STRAM	0.1	1			
												GONO TEUC.	0.1	5			
												HYPERICUM G.	0.1	1			

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100. Include overhanging plants. **Note:** *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m

Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as 1 **400 m² PLOT**

107 HAUSMAN DR. THORNTON.

B. STEWART

26/05/2021

Q07

	Species	Cover	ABUN. ~~Notes~~	NOTES
41	C. MACULATA.	10 %	6	
42	E. PUNCTATA.	5 %	4	
43	E. FIBROSA.	5 %	2	
44	E. SIDEROPHLOIA.	10 %	10	
45	LOBELIA PURPURASCENS.	0.2 %	150	
46	HARDENBERGIA VIOLACEA	0.1 %	20	
47	AURSARIA SPINOSA.	0.1 %	15	
48	CHEILANTHES SIEBERI	0.1 %	5	
49	MICROLAENA STIPOIDES.	10 %	150	
50	ENTOLASIA STRICTA	5 %	70	
51	DESMODIUM VARIANS.	0.1 %	20	
52	LOMANDRA FILIFORMIS SUBSP. COROLLACEA	0 %	30	
53	SENNA GLABRATA.	0.1 %	4	
54	ACACIA SP.	0.1 %	2	
55	PSEUDOSANTHENUM VARIABILE	0.1 %	10	
56	PANICUM SIMILE.	0.2 %	10	
57	LOMANDRA GLAUCA.	0.1 %	1	
58	ARTHROPODIUM MIL.	0.1 %	5	
59	DESMODIUM RHYTIDOPHYLUM.	0.1 %	5	
60	LANTANA CAMARA.	0.1 %	3	
61	LOMANDRA ~~CYLINDRICA~~ CONFERTIFOLIA	0.1 %	2	
62	GLYCINE CLANDESTINA.	0.1 %	5	
63	DICHELACHNE MICRANTHA.	0.1 %	5	
64	ERAGROSTIS BROWNII	0.1 %	5	
65	ECHINOPOGON CAESPITOSUM.	0.2 %	10	
66	ARISTIDA VAGANS.	0.2 %	10	
67	HYPOCHAERIS GLABRATA.	0.1 %	2	
68	IMPERATA CYLINDRICA	0.5 %	50	
69	LOMANDRA LONGIFOLIA.	0.1 %	5	
70	HEITONOPLESIUM CYMOSUM.	0.1 %	2	
71	EXOTIC PALM SEEDLING.	0.1 %	1	
72	THEMEDA AUSTRALIS.	0.5 %	10	
73	GLYCINE TABACINA.	0.2 %	10	
74	CYMBOPOGON REFRACTUS.	0.1 %	2	
75	DIANELLA SP. CAERULEA.	0.1 %	5	
76	RHYTIDOSPERMA CAESPITOSUM.	0.1 %	2	
77	LEPIDOSPERMA LATERALE.	0.1 %	1	
78	AMYEMA SP.	0.1 %	1	(MISTLETOE)
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				

DATE: 26/05/2021	SITE: 107 KRAUSSMAN DR	PLOT ID: Q08	RECORDER: B. STEWART.

GF Code	N, E or HTE	Species Name	Voucher	C	Ab
		29. INDIGOFERA AUSTRALIS.		0.1%	2
		30. DAVEISIA ULICIFOLIA.		0.1%	2
		31. PSEUDERANTHEMUM VARIABILE.		0.1%	15
		32. DESMODIUM ~~VARIANS~~ RYTIDOPHYLLUM		0.1%	5
		33. PASPALUM DILITATUM		0.2%	5
		34. BREYNIA OBLONGIFOLIA.		0.2%	15
		35. SOLANUM PRINOPHYLLUM		0.1%	2
		36. BILLADIERIA SCANDENS		0.1%	1
		37. THEMEDA AUSTRALIS		0.2%	50
		38. LOMANDRA FILIFORMIS SUBSP. CORRIACEA.		0.2%	10
		39. ACACIA PARVIPINNULA.		0.1%	1
		40. EINADIA NUTANS.		0.1%	1
		41. PULTENAEA VILLOSA.		0.1%	2
		42. FALELIS RETUSA.		0.1%	1
		43. SOLANUM NIGRUM.		0.1%	2
		44. ECHINOPOGON CAESPITOSUS.		0.1%	2
		45. ACACIA ELONGATA.		0.2%	1
		46. PULTENAEA PALACEA		0.1%	1
		47. NOTELAEA LONGIFOLIA.		0.1%	1
		48. AMYEMA SPP.		0.1%	1
		49.			
		50.			
		51.			
		52.			
		53.			
		54.			
		55.			
		56.			
		57.			

GF Code: fill in after field, and *circle top 3 dominant spp. in each GF*
N, E or HTE: fill in after field
C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100
C (%): includes overhanging plants
Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only)
Ab: does not include overhanging plants unless there is a cover value in plot but no stems in the plot

Note: 0.1% ≈ 63 x 63 cm
0.5% ≈ 1.4 x 1.4 m
1% ≈ 2.0 x 2.0 m
5% ≈ 4.0 x 5.0 m
25% ≈ 10 x 10 m

DATE: 26/05/2021	SITE: 107 HAUSSMAN DR.	PLOT ID: Q08	RECORDER: B. STEWART.

400 m² PLOT

GF Code	N, E or HTE	Species Name	Voucher	C	Ab
		1. CORYMBIA MACULATA.		15%	8
		2. EUCALYPTUS PANICULATA.		5%	4
		3. EUCALYPTUS FIBROSA.		5%	0
		4. EUCALYPTUS MOLUCANNA.		2%	1
		5. EUCALYPTUS PUNCTATA.		3%	2
		6. EUCALYPTUS UMBRA.		5%	3
		7. MELALEUCA STYPOIDES		10%	200
		8. CHELIANTHES SIEBERI		0.1%	10
		9. ENTOLASIA STRICTA.		5%	100
		10. LOMANDRA FILIFORMIS SUBSP. FILIFORMIS		0.5%	10
		11. LOBELIA PURPURASCENS.		0.2%	50
		12. OPERCULARIA DIPHYLLA.		0.1%	5
		13. BURSARIA SPINOSA.		0.1%	10
		14. DESMODIUM VARIANS		0.1%	2
		15. ARISTIDA VAGANS		0.1%	~~5~~ 10
		16. ACACIA FALCATA.		0.1%	~~5~~ 2
		17. CYANTHILLIUM CINEREUM.		0.1%	~~10~~ 5
		18. GLYCINE TABACINA.		0.1%	~~10~~ 5
		19. IMPERATA CYLINDRICA.		0.1%	~~5~~ 10
		20. LANTANA CAMARA.		0.1%	~~5~~ 10
		21. HARDENBERGIA VIOLACEA.		0.1%	5
		22. PANICUM SIMILE.		0.1%	5
		23. OZOTHAMNUS DIOSMIFOLIUS.		0.1%	5
		24. RYTIDOSPERMA CAESPITOSUM		0.1%	~~10~~ 5
		25. ARTHROPODIUM MILLEFLORUM		0.1%	~~10~~ 5
		26. SENECIO MADAGASCARENSIS.		0.1%	~~5~~ 2
		27. WAHLENBERGIA GRACILIS		0.1%	2
		28. HYPOCHAERIS RADICATA.		0.1%	1

GF Code: fill in after field, and *circle top 3 dominant spp. in each GF*
N, E or HTE: fill in after field
C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100
C (%): includes overhanging plants
Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only)
Ab: does not include overhanging plants unless there is a cover value in plot but no stems in the plot

Note: 0.1% ≈ 63 x 63 cm
0.5% ≈ 1.4 x 1.4 m
1% ≈ 2.0 x 2.0 m
5% ≈ 4.0 x 5.0 m
25% ≈ 10 x 10 m

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR	PLOT ID: WALKOVER	RECORDER: B. STEWART

Note that strata information is not the same as GF Code or N, E, HTE, which needs to be assigned to each species after field work is completed.

Canopy Species			Understorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			[illegible]		
	C	Ab		C	Ab		C	Ab		C	Ab		C	Ab		C	Ab
CIRSIUM V.																	
EINADIA N.																	
PLANTAGO L.																	
CAS. GLAUC.																	
TYPHA																	
MEGA. MAX.																	
A. COSTATA																	
ACACIA IRR.																	
PHYTOLACA. OC.																	
PHYLLRUM																	
SOLANUM MAJ.																	
ASPARAG. AE.																	

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3; ..., 10, 15, 20, 25, 30, ... (to nearest 5%), 100. Include overhanging plants.
Ab: 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only). If overhanging species do not occur in plot, record abundance as 1

Note: *0.1%* ≈ 63 x 63 cm, *0.5%* ≈ 1.4 x 1.4 m, *1%* ≈ 2.0 x 2.0 m, *5%* ≈ 4.0 x 5.0 m, *25%* ≈ 10 x 10 m
400 m² PLOT

DATE: 12-05-2021	SITE: 107 HAUSSMAN DR.	PLOT ID: Q01	RECORDER: B. STEWART.
Record GPS coord at start & end? ✓	Photos (portrait / landscape) at start & end? ✓	Magnetic bearing: 251°	
PCT:	Veg Class: HUNTER - MACLEAY DRY SCL.		

1000 m² PLOT

Tree Stem Size Class*		Eucalypt species^	Non-eucalypt species
Count of Large Trees (record DBH of each tree at 1.3 m from ground)	80+ cm	—	—
	50+ cm	—	—
All other Trees: Only record ***presence or absence*** of trees in these stem size classes	30-49 cm	—	—
	20-29 cm	—	—
	10-19 cm	—	—
	5-9 cm	—	—
Count of **Regeneration**	<5 cm	1 ✓	—

HBT†	
<20 cm	20 cm+
N|A	N|A

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
^Includes species of *Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia*

†Count of hollow-bearing trees and shrubs; includes living and dead; record by stem size class.

Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0	TOTAL LENGTH (m)

1 m² subPLOT

	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot	5	15	5	45	15															
Average	17.																			

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20mm.

Physiography + Site Features (may help in determining PCT and Management Zones)

Morphological Type		Landform Element		Site Drainage	
Lithology	CLAY SOILS	Landform Pattern		Distance to nearest water and type	
Slope and Aspect	W	Soil Colour	LIGHT BROWN - GREY	Microrelief	B

Plot Disturbance:

	Severity	Age		Severity	Age
Clearing (incl. logging)	3	R	Fire damage	.	
Cultivation (incl. pasture)			Storm damage		
Soil erosion	2	R	Weediness	2-3	R.
Firewood removal			Other		
Grazing (native vs stock)					

Severity: 0 = no evidence, 1 = light, 2 = mod, 3 = severe
Age: R = (recent), NR = not recent (3-10 yrs), O = old (>10 yrs)

DATE: 12-05-2021	SITE: 107 HANSSMAN	PLOT ID: Q02	RECORDER: B. STEWART
Record GPS coord at start & end? ✓	Photos (portrait / landscape) at start & end? ✓	Magnetic bearing: 059°	
PCT:	Veg Class: DRY SCLEROPHYLL		

1000 m² PLOT

Tree Stem Size Class*		Eucalypt species^	Non-eucalypt species
Count of Large Trees (record DBH of each tree at 1.3 m from ground)	80+ cm	—	—
	50+ cm	—	—
All other Trees: Only record ***presence or absence*** of trees in these stem size classes	30-49 cm	—	—
	20-29 cm	—	—
	10-19 cm	—	—
	5-9 cm	—	—
Count of **Regeneration**	<5 cm	23	—

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
^Includes species of *Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia*

HBT†	
<20 cm	20 cm+
N/A	N/A.

†Count of hollow-bearing trees and shrubs; includes living and dead; record by stem size class.

Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	1 + 0.5 + 1	TOTAL LENGTH (m) 2.5m.

1 m² subPLOT

	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot	5	35	35	5	15	75	30	20	40	25										
Average	19																			

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20mm.

Physiography + Site Features (may help in determining PCT and Management Zones

Morphological Type		Landform Element		Site Drainage	
Lithology	SANDSTONE. CLAY SOIL	Landform Pattern		Distance to nearest water and type	
Slope and Aspect	FLAT	Soil Colour	LIGHT BROWN.	Microrelief	

Plot Disturbance:

	Severity	Age		Severity	Age
Clearing (incl. logging)	3	R	Fire damage		
Cultivation (incl. pasture)			Storm damage		
Soil erosion	2	R.	Weediness	3	R.
Firewood removal			Other		
Grazing (native vs stock)					

Severity: 0 = no evidence, 1 = light, 2 = mod, 3 = severe.
Age: R = (recent), NR = not recent (3-10 yrs), O = old (>10 yrs)

DATE: 12-05-2021	SITE: 107 HAUSSMAN	PLOT ID: Q03	RECORDER: B. STEWART
Record GPS coord at start & end? ✓	Photos (portrait / landscape) at start & end? ✓	Magnetic bearing: 056°	
PCT:	Veg Class: DRY SCLEROPHYLL		

1000 m² PLOT

Tree Stem Size Class*		Eucalypt species^	Non-eucalypt species	HBT† <20 cm	HBT† 20 cm+
Count of Large Trees (record DBH of each tree at 1.3 m from ground)	80+ cm	1	—	1	—
	50+ cm	1	—	—	—
All other Trees: Only record ***presence or absence*** of trees in these stem size classes	30-49 cm	✓	—		
	20-29 cm	—	—	—	—
	10-19 cm	✓	—	—	—
	5-9 cm	✓	—	—	—
Count of **Regeneration**	<5 cm	13	—	—	—

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
^Includes species of *Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia*

†Count of hollow-bearing trees and shrubs; includes living and dead; record by stem size class.

Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	1 + 3 +	**TOTAL LENGTH (m)** 4m

1 m² subPLOT

	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot	45	50	5	15	80	15	5	25	15	0										
Average	39																			

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20mm.

Physiography + Site Features (may help in determining PCT and Management Zones

Morphological Type		Landform Element		Site Drainage	
Lithology	SANDSTONE / CLAY SOIL	Landform Pattern		Distance to nearest water and type	
Slope and Aspect	W	Soil Colour	BROWN	Microrelief	

Plot Disturbance:

	Severity	Age		Severity	Age
Clearing (incl. logging)	2-3	R	Fire damage		
Cultivation (incl. pasture)			Storm damage		
Soil erosion	1	R	Weediness	2	R
Firewood removal			Other		
Grazing (native vs stock)					

Severity: 0 = no evidence, 1 = light, 2 = mod, 3 = severe.
Age: R = (recent), NR = not recent (3-10 yrs), O = old (>10 yrs)

DATE: 12-05-2021	SITE: 107 HAUSSMAN	PLOT ID: Q04	RECORDER: B. STEWART.
Record GPS coord at start & end?		Photos (portrait / landscape) at start & end?	Magnetic bearing: 165°
PCT:		Veg Class: DRY SCLEROPHYLL	

1000 m² PLOT

Tree Stem Size Class*		Eucalypt species^	Non-eucalypt species
Count of Large Trees (record DBH of each tree at 1.3 m from ground)	80+ cm	1	—
	50+ cm	—	—
All other Trees: Only record ***presence or absence*** of trees in these stem size classes	30-49 cm	✓	—
	20-29 cm	✓	—
	10-19 cm	✓	—
	5-9 cm	—	—
Count of **Regeneration**	<5 cm	9	—

HBT†	
<20 cm	20 cm+
N/A	N/A

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
^Includes species of *Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia*

†Count of hollow-bearing trees and shrubs; includes living and dead; record by stem size class.

Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	2 + 2 + 2 + 2	TOTAL LENGTH (m) 8m.

1 m² subPLOT

	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot	65	40	90	50	70	25	35	0	10	5										
Average	63																			

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20mm.

Physiography + Site Features (may help in determining PCT and Management Zones

Morphological Type		Landform Element		Site Drainage	
Lithology	SANDSTONE CLAY SOIL.	Landform Pattern		Distance to nearest water and type	
Slope and Aspect	S	Soil Colour	LIGHT - DARK BROWN.	Microrelief	

Plot Disturbance:

	Severity	Age		Severity	Age
Clearing (incl. logging)	2	R.	Fire damage		
Cultivation (incl. pasture)			Storm damage		
Soil erosion			Weediness	2	R
Firewood removal			Other		
Grazing (native vs stock)			(RECENT LANTANA CONTROL)		

Severity: 0 = no evidence, 1 = light, 2 = mod, 3 = severe.
Age: R = (recent), NR = not recent (3-10 yrs), O = old (>10 yrs)

DATE: 12-05-21	SITE: 107 HAUSSMAN	PLOT ID: Q05	RECORDER: B. STEWART
Record GPS coord at start & end?		Photos (portrait / landscape) at start & end?	Magnetic bearing: 011°
PCT:		Veg Class:	

1000 m² PLOT

Tree Stem Size Class*		Eucalypt species^	Non-eucalypt species
Count of Large Trees (record DBH of each tree at 1.3 m from ground)	80+ cm	—	—
	50+ cm	3	—
All other Trees: Only record ***presence or absence*** of trees in these stem size classes	30-49 cm	✓	—
	20-29 cm	—	—
	10-19 cm	✓	—
	5-9 cm	✓	—
Count of **Regeneration**	<5 cm	5	—

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
^Includes species of *Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia*

HBT†	
<20 cm	20 cm+
—	—
1	—
1	—
2	—
—	—
—	—
—	—

†Count of hollow-bearing trees and shrubs; includes living and dead; record by stem size class.

Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0	TOTAL LENGTH (m)

1 m² subPLOT

	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot	30	85	10	60	10	5	10	10	0	0										
Average	39																			

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20mm.

Physiography + Site Features (may help in determining PCT and Management Zones

Morphological Type		Landform Element		Site Drainage	
Lithology	SANDSTONE CLAY. SOIL	Landform Pattern		Distance to nearest water and type	
Slope and Aspect	S	Soil Colour	LIGHT BROWN	Microrelief	

Plot Disturbance:

	Severity	Age		Severity	Age
Clearing (incl. logging)	2-3	R	Fire damage		
Cultivation (incl. pasture)			Storm damage		
Soil erosion			Weediness	2	R
Firewood removal			Other		
Grazing (native vs stock)					

Severity: 0 = no evidence, 1 = light, 2 = mod, 3 = severe.
Age: R = (recent), NR = not recent (3-10 yrs), O = old (>10 yrs)

DATE: 12-05-2021	SITE: 107 HAUSSMAN	PLOT ID: 006	RECORDER: B. STEWART
Record GPS coord at start & end? ✓	Photos (portrait / landscape) at start & end? ✓	Magnetic bearing: 112°	
PCT:	Veg Class:		

1000 m² PLOT

Tree Stem Size Class*		Eucalypt species^	Non-eucalypt species
Count of Large Trees (record DBH of each tree at 1.3 m from ground)	80+ cm	—	—
	50+ cm	—	—
All other Trees: Only record ***presence or absence*** of trees in these stem size classes	30-49 cm	—	—
	20-29 cm	—	—
	10-19 cm	—	—
	5-9 cm	—	—
Count of **Regeneration**	<5 cm	10	—

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present; trees with stem class size <5 cm is treated as **regeneration**.
^Includes species of *Eucalyptus, Corymbia, Angophora, Lophostemon, Syncarpia*

HBT†	
<20 cm	20 cm+
N/A	N/A.

†Count of hollow-bearing trees and shrubs; includes living and dead; record by stem size class.

Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0	TOTAL LENGTH (m)

1 m² subPLOT

	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot	5	15	0	50	5	5	0	0	0	5										
Average	15																			

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**; also includes dead material attached to living plants, as long as they are touching ground or close enough to act as functional litter. **Rock** includes units >20mm.

Physiography + Site Features (may help in determining PCT and Management Zones

Morphological Type		Landform Element		Site Drainage	
Lithology	CLAY SOIL	Landform Pattern		Distance to nearest water and type	
Slope and Aspect	E	Soil Colour	BROWN.	Microrelief	

Plot Disturbance:

	Severity	Age		Severity	Age
Clearing (incl. logging)	3	R	Fire damage		
Cultivation (incl. pasture)			Storm damage		
Soil erosion			Weediness	2-3	R.
Firewood removal			Other		
Grazing (native vs stock)					

Severity: 0 = no evidence, 1 = light, 2 = mod, 3 = severe.
Age: R = (recent), NR = not recent (3-10 yrs), O = old (>10 yrs)

BAM Site – Field Survey Form

Site Sheet no: 1 of _____

		Survey Name	Zone ID	Recorders			
Date	26/05/21			JAMES B, BEN S.			
Zone	Datum	Plot ID	Q07	Plot dimensions	20x50	Photo #	✓
56H							
Easting	Northing	IBRA region	SYDNEY BASIN	Midline bearing from 0 m	86°E	Magnetic °	
372134	6373374						
Vegetation Class		DRY SCLEROPHYLL FOREST SHRUB/GRASS FORM.				Confidence: H M L	
Plant Community Type		HUNTER MACLAY DRY SCLEROPHYLL		EEC: tick		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	𝍸	
20 – 29 cm	𝍸 𝍸	
10 – 19 cm	𝍸 ||	
5 – 9 cm	𝍸	
< 5 cm	𝍸	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1+	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	40	70	30	90	50	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	56%																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture	Sandy	Soil Colour	Grey	Soil Depth	
Slope	light decline	Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			evidence of previous clearing.
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

2.5m

10

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

Site Sheet no: 1 of _____

		Survey Name	Zone ID	Recorders			
Date	26/05/21			BEN. S , JAMES. B			
Zone 56H	Datum	Plot ID	Q08	Plot dimensions	10x100	Photo #	✓
Easting 372140	Northing 6373819	IBRA region	SYDNEY BASIN	Midline bearing from 0 m	60°	Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type				EEC: tick		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	11	
30 – 49 cm	1111	
20 – 29 cm	1111	
10 – 19 cm	1111 1111 1111 1111	
5 – 9 cm	1111 1111	
< 5 cm	1111 1111 1111 111	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	473+	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	90	70	50	20	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	62.1																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture	sandy.	Soil Colour	light grey	Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			evidence of select logging. cut stumps.
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)